Prevention of Significant Deterioration (PSD) Air Permit Application for Plant OX Modernization/Debottleneck Project

BP Amoco Chemical Company – Cooper River Plant
Wando, South Carolina

April 2013, Revised March 2014 and July 2014

Non-confidential

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TRC Environmental Corporation | BP Amoco Chemical Company - Cooper River Plant
PSD Air Permit Application
OX Modernization/Debottleneck Project
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Section 1
Introduction

1.1 Background

BP Amoco Chemical Company – Cooper River Plant (BP CR) currently owns and operates a chemical manufacturing facility in Wando, South Carolina that produces purified terephthalic acid (PTA). The BP CR plant, wholly owned and operated by BP, is located on a 6,000-acre site in Berkeley County, South Carolina on the east bank of the Cooper River, about 16 miles upstream of the Atlantic Ocean. The facility location is as follows:

BP Amoco Chemical Company – Cooper River Plant
1306 Amoco Drive
Wando, South Carolina 29492

The BP CR Plant falls under the Standard Industrial Classification (SIC) Code 2869. The product PTA is a white, inert powder used to make polyester fibers, bottles, and films. The major raw materials in the production of PTA are paraxylene (PX), acetic acid (HAC), and hydrogen. Plant operation consists of the following five major processes:

1. Oxidation (OX) units for production of crude terephthalic acid (TA)
2. PTA units for purification of crude TA into PTA
3. Product loading/shipping
4. Utilities
5. Wastewater treatment.

Crude TA is produced in the OX units by the air oxidation of PX in an HAC solution and the presence of a catalyst at high temperature and pressure. The crude TA is crystallized and separated from the mother liquor and dried. Catalyst and mother liquor recycle are routinely operated at very high rates as a result of waste minimization and economic initiatives at the plant.

Crude TA is purified in the PTA units in an aqueous solution by hydrogenation in the presence of a catalyst. The purified product is crystallized, separated, dried, and shipped. Reject product from the silo baghouse, or loading shaker screens is routinely rerun, as an alternative to sending it to the wastewater treatment unit. TA solids in the wastewater treatment plant (WWTP) influent are settled out, recovered, and can be sold as a product, BACA (byproduct aromatic carboxylic acid).

1.2 Purpose and Scope

BP CR has retained TRC Environmental Corporation (TRC) to assist in the preparation of an air construction permit application package for the proposed revisions at the BP CR facility. BP CR is currently a Title V source and a major source for both hazardous air pollutants (HAPs) and Prevention of Significant Deterioration (PSD). BP CR is proposing revisions to the #1 OX and #2 OX units to debottleneck these units so they are able to operate at their design production on a consistent basis. Minor revisions to the #1 and #2 PTA are also proposed that will not impact their capacity but will reduce their production costs. This project will be a phased construction with the initial work on the #1 OX and PTA units beginning in late 2014 and the revised units expected to start-up in mid to late 2016. The work on the #2 OX and PTA units is expected to begin in early 2017 and the revised units startup to occur by early 2019.

This project will result in an actual annual hourly (TA and PTA) production rate closer to the unit design rate. This project will not result in any increase in the maximum hourly emissions, the maximum hourly production rate, the maximum annual potential emission rates, or the maximum annual potential production rates above those used in previous permit applications. The project will modify the cooling tower systems to provide additional cooling capacity. This project will not revise any of the other auxiliary facilities but will require slightly more boiler steam, increase PX flow through the Tank Farm, and increase the PTA production into the product silos and loading that can all be provided without any changes to these systems. The project is referred to as the OX Modernization/Debottleneck Project.

These revisions will be completed over the next 5 years as unit shutdowns allow the tie-ins to be completed.

A PSD applicability analysis has been performed for the project recognizing that the area is in attainment for all pollutants. The PSD applicability analysis for this project recognizes the impact of the revisions on both OX and PTA units and the additional steam production, wastewater treatment, and shipping volumes necessary to accommodate these changes. The project PSD applicability analysis demonstrates that a significant net emissions increase will occur for carbon monoxide (CO) and volatile organic compounds (VOCs); therefore the project is subject to review under the PSD permitting program for those pollutants. Other pollutants were evaluated and determined to have increases that are projected to be less than PSD significance thresholds so they will only be subject to the normal air construction permitting. The Federal Land Manager (FLM) responsible for the Romaine Wilderness area, which is a federal Class 1 Wilderness about 30 miles from the site, was contacted to determine the FLM's interest in the PSD application. After providing the FLM with the emissions impacts from the project, the FLM replied by email (see Appendix F) that they were not requesting that a Class I Air Quality Related Value (AQRV) analysis be included in the PSD permit application. BP CR is required to file a permit application with South Carolina Department of Health and Environmental Control (SC DHEC) to obtain approval to commence construction on the project via the issuance of an air construction permit. To satisfy this requirement, this permit application has been prepared in accordance with SC DHEC guidelines for air construction permitting including the required PSD permitting elements for CO and VOC. This application contains the following items:

- Section 1 — Introduction
- Section 2 — Project Description
- Section 3 — Regulatory Assessment
- Section 4 — Best Available Control Technology Analysis for Volatile Organic Compound Emissions and Carbon Monoxide
- Section 5 — Air Quality Analysis
- Section 6 — Additional Impacts Analysis
- Appendix A — SC DHEC Permit Application Forms
- Appendix B — Emissions Data and Calculations
- Appendix C — RBLC Search Results
- Appendix D — BACT Analysis Cost Information

1.3 Facility Location and Contact

All correspondence regarding this permit application should be sent to:

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TRC Environmental Corporation
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Greenville, SC 29615
mdoerner@trcsolutions.com
864.234.9481

Section 2
Project Description

2.1 Existing Process Description

The BP CR processes consist of the two OX units, the two PTA units, and the shipping and loading area. The OX areas are where the process actually begins producing TA. In the PTA units, the TA is purified to produce PTA and sent to shipping and loading where it is stored in one of several silos and loaded into shipping containers. A simplified flow of the overall process is shown in Figure 2-1.1. Simplified process diagrams of the existing processes are shown in Figure 2-1.2 through Figure 2-1.5.

In the OX unit, a BP proprietary process is used for the catalytic liquid phase air oxidation of PX to produce TA. HAC, PX, and catalyst solution are mixed in a feed mix drum. The feed mix from the drum and air from the process air compressor are continuously fed to the reactors. Exothermic heat of reaction is removed by condensing the boiling reaction solvent. A portion of this condensate is withdrawn to control the water concentration in the reactor and the remainder is refluxed back to the reactor.

Reactor effluent is depressurized and cooled to filtering conditions in a series of crystallizers to form the solid TA crystals. Air is fed to the first crystallizer for additional reaction. The crystallizer temperatures are controlled by allowing a portion of the reaction solvent to flash off. The crystallizer vent streams are sent to the dehydration tower (DHT) or the High Pressure Absorber (HPA) for recovery of valuable materials. The DHT also removes water formed in the reaction. The crystallizer precipitate TA is recovered by filtration and finally dried. The dried TA solids are conveyed to the OX intermediate storage silos (TA) silos and stored for additional processing in the PTA unit.

The off-gas from the OX reactors is combined with the DHT overhead gases that have been compressed in the low pressure vent gas treatment (LPVGT) equipment. The combined gases pass through a recovery device, the HPA, before being sent to a control device, the high pressure vent gas treatment system (HPVGTS) in which CO, VOC, and HAP are nearly totally destroyed and then the gas is emitted to the atmosphere. The HPVGTS reactor contains catalyst bricks that are routinely changed out based on their activity and mechanical condition. Further processing in the OX unit is required to recover and purify HAC from the reactor outlet, crystallizer solvent withdrawal streams, and also from the un-recycled mother liquor stream. OX byproducts are separated from the HAC in a *confidential* evaporation process and then purged.

The PTA unit is also a continuous operation. Crude TA is fed from the OX intermediate storage silos to the feed slurry drum to produce the slurry of TA crystals and water. The slurry is heated to dissolve the TA and then the slurry enters the hydrogenation reactor where it reacts to convert the impurities into a form that can be separated from the product. The PTA reactor catalyst is routinely changed out based on its activity and mechanical condition. After reaction, the solution goes through a cycle of lowering the pressure and cooling to crystallize the PTA. A portion of the aromatic acids in the mother liquor are recovered by cooling and filtering the mother liquor; the aromatic acids are recycled back to the OX reaction unit.

The crystallized PTA is recovered from the mother liquor by separation in the filtration section of the unit. The final product is dried and transferred to the PTA day silos and then to the PTA product storage silos.

The #1 and #2 Cooling Towers supply non-contact cooling water to the respective #1 OX/PTA and #2 OX/PTA units. The Cooling Tower particulate matter (PM) emissions are Title V insignificant activities.

2.2 Project Description

The BP CR Modernization/Debottleneck project will be revising the OX and PTA units to remove limitations that prevent the OX units from operating at their unit design rates and reduce the OX and PTA unit operating costs. These revisions will include improvements to the reaction environment (such as replacement of the #1 OX reactors with a more efficient design and direct PX injection), additional air capacity, optimization of the recovery systems, improved DHT operation, improved energy recovery, removal of several emission points, dense phase conveying and additional cooling tower capacity. Simplified process diagrams of the future processes are shown in Figures 2-2.1 to 2-2.4.

The changes to the existing OX unit process description include the following items:

- PX would bypass the feed mix drum and be sent directly to the reactor.
- The first crystallizer vent stream for both units will only be sent to the HPA for recovery of valuable materials.
- The LPVGT will be removed so the DHT overhead vent stream will be routed to the Low Pressure Absorber (LPA) before being exhausted
- The DHT operation will be converted to an azeotropic distillation process and an additional tower will be added to recover the azeotropic chemical
- The two-stage evaporation process to remove byproducts and the catalyst recovery process will be removed

BP CR proposes to complete the unit revisions over the next 5 years as unit shutdowns allow the tie-ins to be completed and the equipment to be installed.

The major equipment revisions included in the proposed project are the following items on the units:

1. #1 OX unit

   - Replacement of four reactors (BR-301 A-D) with a single more efficient reactor (BR-301)
   - Replacement of reactor overhead condenser system
   - Replacing the air compressor rotor to reduce energy consumption
   - Direct PX injection to reactor
   - Additional reactor overhead recovery capacity by replacing equipment with an improved design
   - Route 1st crystallizer (BD-401) vent to reactor off-gas recovery system
   - Maintain power recovery in off-gas expander by lowering upstream pressure drop
   - Azeotropic distillation on DHT (*azeotropic distillation* refers to the technique of adding another component to generate a new, lower-boiling azeotrope that is heterogeneous [*e.g.*, producing two, immiscible liquid phases].)
   - Revised DHT overhead recovery system to a two-stage system by:
     - § Routing existing DHT Scrubber (BT-702) vent to LPA (BT-603)
     - § Revise LPA packing
     - § Convert DHT Scrubber to a one-stage acid scrubber
   - Revised HPA (T-401) internals
   - Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas
   - Additional filtration capacity
   - Removal of the LPVGT compressor (BC-710)
   - Removal of the solvent stripper (BT-605)
   - Removal of the residue evaporator (BM-606) and catalyst recovery unit (BD-625/631/632/BE-645)
   - Removal of PX Stripper (BT-740)
   - Addition of a steam turbine to generate power from excess low pressure steam

– Addition of a fixed roof NBA storage tank
– Replace existing BM-1201 Emergency Generator
– Install new BM-1204 Emergency Generator

2. #1 PTA unit
   – Revisions to crystallizer vent scrubber (CM-301) to improve energy recovery
   – Addition of 5th crystallizer (CD-30x)
   – Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas
3. #2 OX unit
   – Direct PX injection to reactor
   – Rerating the process air compressors for additional capacity
   – Replacement of reactor overhead condenser
   – Azeotropic distillation on DHT (*azeotropic distillation* refers to the technique of adding another component to generate a new, lower-boiling azeotrope that is heterogeneous [*e.g.*, producing two, immiscible liquid phases].)
   – Modified packing or trays in DHT (DT-403), HPA (DT-111), LPA (DT-302), Dryer Scrubber (DT-301) and HPVGTS Scrubber (DT-1821).
   – Routing DHT vent to revised LPA system
   – Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas
   – Removal of the LPVGT compressor (DC-304)
   – Removal of the solvent stripper (DT-402)
   – Removal of the residue evaporator (DM-403) and catalyst recovery unit (DD-412/413/414/DE-416)
   – Removal of PX Stripper (DT-404)
   – Addition of a steam turbine to generate power from excess steam
   – Addition of a fixed roof NBA storage tank
4. #2 PTA Unit
   – Revisions to crystallizer vent scrubber (DM-601) to improve energy recovery
   – Revision of piping system from PTA Feed Drum (DD-500) to the Sundyne pumps.
   – Addition of a 4th Sundyne pump
   – Dense phase conveying

– Replacement of dryer (DM-703)

– Dense phase conveying by changing system piping and rotary locks to allow conveying solids with less carrier gas

5. Cooling Towers

   – Additional #1 Cooling Tower capacity

   – Additional #2 Cooling Tower capacity

The project will also include smaller items that will occur on all the units in the following general categories:

1. Additional and/or improved automation, multivariable control schemes, and on-line analyzers to increase unit reliability and improve process control.
2. Replacement of process equipment and piping that are negatively impacting maintenance costs and unit reliability.
3. Replacement of obsolete or end-of-life equipment that will not impact capacity, throughput or emissions It will include equipment for which replacement parts are no longer available and equipment which the inspection services survey prior to the start of construction has determined is worn/corroded enough that it should be replaced for safety reasons.
4. Replacement of exchangers and vessels to improve metallurgy, reduce corrosion, and reduce maintenance costs.

2.3 Unit Emissions

Emissions calculations for the units and a summary of the facility-wide emissions are included in Appendix B (Tables B-1 through B-11) of this application to determine PSD applicability. A summary of the PSD analysis in Appendix B is shown in Table 2.3.1 indicating that the only pollutants with increases above the baseline actual emissions greater than the PSD significance thresholds are CO and VOC. The unit's potential-to-emit (PTE) emissions are based on 8,760 hours per year of operation at their design capacities. The emissions include the impact of the incremental boiler steam production emissions, and the increased tank farm and shipping and loading emissions due to additional PTA production. The boilers have excess capacity available within their previously permitted limits and can provide the steam without making any revisions to the boilers. Both the Tank Farm and the Shipping and Loading areas have the capacity available to handle the increased flows without requiring any modifications. The addition of the azeotropic distillation to the OX units will add new pollutants (n-butyl acetate and butanol) to the emissions from the units.

The emissions calculations in Appendix B provide the various emissions estimates requested in the applications forms. The PSD emission calculations for the modified units (#1 OX, #2 OX, #1 PTA, #2 PTA, and Cooling Towers) are based on Post Project PTE – Baseline Average Emissions (BAE). The PSD emission calculations for the unmodified but debottlenecked units (Tank Farm and Shipping) are based on PTE-BAE. The PSD emission calculations for the incremental boiler steam are based on the emissions from producing the additional steam required by the project. The pre- and post-emissions are calculated for both the controlled and uncontrolled scenarios. The uncontrolled emissions estimates assume 0 percent recovery/ removal for the control devices. The emissions calculations are included in Appendix B in the following tables as shown in Table 2.3.2.

Table 2.3.1
Prevention of Significant Deterioration Analysis Summary

Step 1

POLLUTANTS	TOTAL PTE (before BACT)	TOTAL TWO-YEAR BASELINE AVERAGE	DELTA	PSD SIGNIFICANCE	ABOVE PSD
NO_X	30.9	3.1	27.8	40	No
VOC	487.8	323.4	164.4	40	**Yes**
CO	964.6	346.7	617.9	100	**Yes**
SO_2	0.3	0.04	0.2	40	No
PM	40.7	33.7	7.0	25	No
PM_{10}	39.6	33.0	6.6	15	No
$PM_{2.5}$	36.8	31.1	5.8	10	No
CO_2e	87,122	69,793	17,328	75,000	No

Contemporaneous Emissions

PROJECT	YEAR	CO (tpy)	VOC (tpy)
502b10 - CR #1 OX BR-301A Alternate Water Withdrawal	2008	0.0	0
PTA FIP Project (Permit CS)	2008	0.01	8.24
502b10 - #1 OX/PTA Op Flex	2011	0	0
PTA BHS Filter Project	2012	26.9	27.6
Total	**---**	**26.9**	**35.8**

Table 2.3.1
Prevention of Significant Deterioration Analysis Summary

Step 2 – Facility Netting

POLLUTANTS	VOC	CO	NO_X	SO_2	PM	PM_{10}	$PM_{2.5}$	CO_2e
Step 1 Delta	164.4	617.9	27.8	0.2	7.0	6.6	5.8	17,300
Total Contemporaneous	35.8	26.9	N/A	N/A	N/A	N/A	N/A	N/A
Net Emissions	200.3	644.8	27.8	0.2	7.0	6.6	5.8	17,300
PSD Significance	40	100	40	40	25	15	10	75,000
Above PSD	**Yes**	**Yes**	No	No	No	No	No	No

Table 2.3.2
Appendix B Tables

TABLE NO	CALCULATION
1	PSD Applicability Summary
2 through 7	PSD Applicability for Modified Units
8 through 9	Debottleneck Emissions for Unmodified Units
10	Boiler Emissions from Incremental Steam Production
11	Post Project Facility-Wide Controlled Emissions
12	Uncontrolled Pre- and Post-Project PTE Emission Summary
13 through 18	Uncontrolled Pre- and Post-Project Modified Unit PTE Emissions
19	Facility Pre-project Controlled PTE Emissions Summary
20 through 25	Modified Units Pre-project PTE Emissions
26	Unmodified Unit Controlled and Uncontrolled PTE Emissions Summary
27 through 29	Unmodified Unit Controlled and Uncontrolled PTE Emissions
30	HAPs Emissions
31	Cooling Tower Sample Calculations

2.4 Prevention of Significant Deterioration Emission Limits

As a result of this application and the Best Available Control Technology (BACT) analysis included for VOC and CO emissions, the following existing PSD avoidance limits shown in Table 2.4.1 are requested to be removed and replaced by the applicable BACT/PSD limits shown in the table. The PSD analysis has included the emission impacts of the removal of these PSD avoidance limits on the resulting PTE emissions.

Table 2.4.1
Emission Limit Revisions

EMISSION POINT	POLLUTANT	PREVIOUS PSD AVOIDANCE LIMITS[1]	REQUESTED BACT/PSD LIMITS (lbs/hr)	BACT/PSD LIMITS (Averaging Time)
#1 OX LPA	VOC	80 tpy and 40 lb/hr	9.6[2]	3 hours
	CO	40 tpy	4.1	30 days
#1 DHT Scrubber	VOC	165 tpy and 60 lb/hr	N/A – Will no longer vent to atmosphere	
	CO	380 tpy		
#1 HPVGTS	VOC	80 tpy and 85 lb/hr	4.7	3 hours
	CO	375 tpy and 1,452 lb/hr	87.9	30 days
#1 PTA Crystallizer Vent Scrubber	VOC	None	20.0	3 hours
	CO	None	24	30 days
#2 LPA	VOC	215.9 tpy and 49.3 lb/hr	8.9	3 hours
#2 OX HPVGTS			3.5	3 hours
#2 PTA Crystallizer Vent Scrubber			20.0	3 hours
#2 OX HPVGTS Heater			0.0055 lbs/MMBtu	3 hours
#2 LPA	CO	None	3.5	30 days
#2 OX HPVGTS			75.1	30 days
#2 PTA Crystallizer Vent Scrubber			20	30 days
#2 OX HPVGTS Heater			0.084 lbs/MMBtu	3 hours
#1 & #2 OX Fugitives	VOC/HAPS	None	Comply with HON LDAR	
Combined total for #1 OX and #2 OX, #1 PTA and #2 PTA	VOC	1,825 tpy	Replaced by individual vent limits	

(1) All these previous PSD avoidance limits are requested to be removed
(2) This limit accounts for the emissions from DHT Scrubber vent that used to go to atmosphere

The existing synthetic minor (PSD avoidance) VOC emission limit of 49.3 lbs/hr that was included in the construction permit CF for the addition of the #2 unit will be revised. Table 2.4.2 shows the original limit basis and the basis for the requested revised VOC emission limit of 3.79 lbs/hr.

Table 2.4.2
Construction Permit CF Synthetic Minor VOC Emission Limit

SOURCE	PERMIT VOC EMISSIONS (lb/hr)	BACT ANALYSIS OF SOURCE	PSD AVOIDANCE VOC EMISSIONS (lbs/hr)
# 2 OX Unit	15.57	Yes	N/A
#2 PTA	25.6	Yes	N/A
# 2 Fugitives	3.5	Yes	N/A
#2 OX HPVGTS (Fired Heater)	0.84	Yes	N/A
Tank Farm(1)	0.02	No	0.02
Anaerobic Reactor	0.31	No	0.31
Wastewater Fugitives*	3.11	No	3.11
CO2 Stripper	0.35	No	0.35
PSD Avoidance Limit (lbs/hr)	**49.26**	----	**3.79**

(1) These are the incremental emissions based on additional flows due to #2 unit

BP will continue to abide by all of the other synthetic minor (PSD avoidance) limits in the existing Title V permit as they presently exist. This includes all limits for PM, particulate matter (nominally 10 microns or less) (PM_{10}), nitrogen oxides (NO_X), and sulfur dioxide (SO_2) in the existing Title V permit. Table 2.4.3 shows those synthetic minor limits that will remain unchanged and to which CR BP will continue to abide.

Table 2.4.3
Unchanged Synthetic Minor Emission Limits

EMISSION POINT	POLLUTANT	PSD AVOIDANCE LIMITS
#1 OX Silo Scrubber	PM_{10}	2.16 lb/hr
Silos CF-701 A-E	PM_{10}	1.08 lb/hr (each)
Silo CF-701 F	PM_{10}	0.48 lb/hr
Boilers AB-350 A/B	PM/PM_{10}	50.9 tpy combined
	SO_2	733.4 tpy combined
Boilers AB-350 A/B	NO_X	317.0 tpy combined
	CO	299.6 tpy combined

2.5 Best Available Control Technology Monitoring

Table 2.5.1 is a summary of the proposed monitoring parameters from the BACT analysis contained in Section 4 of this application. The operational ranges for the proposed monitoring parameters will be submitted to SC DHEC along with supporting documentation within 180 days of completing the project construction. The operational range of the parameters will be determined based on operational and stack test data, vendor recommendations, equipment design properties, as visual inspections as appropriate for a parameter.

Table 2.5.1
BACT Monitoring Parameters

UNIT	EMISSION POINT	POLLUTANT	PARAMETER 1 MONITORED	PARAMETER 2 MONITORED
#1 OX	LPA	VOC	Scrubbing Liquid Fluid Flow	Scrubber Top Temperature
	HPVGTS	VOC	Reactor Inlet Temperature	Reactor Outlet Temperature
	Equipment Fugitives	VOC	HON LDAR Monitoring program	N/A
#2 OX	LPA	VOC	Scrubbing Top Liquid Fluid Flow	Scrubber Top Temperature
	HPVGTS	VOC	Reactor Inlet Temperature	Reactor Outlet Temperature
	Equipment Fugitives	VOC	HON LDAR Monitoring program	N/A
	HPVGTS Heater	VOC	Completion of tune-ups in accordance with 40 CFR 63 Subpart DDDDD	N/A
#1 PTA	Crystallizer Vent Scrubber	VOC	Specialized Performance Test every 5 years	N/A
#2 PTA	Crystallizer Vent Scrubber	VOC	Specialized Performance Test every 5 years	N/A
#1 OX	LPA	CO	Performance Test every 3 years	N/A
	HPVGTS	CO	Reactor Inlet Temperature	Reactor Outlet Temperature
#1 PTA	Crystallizer Vent Scrubber	CO	Specialized Performance Test every 5 years	N/A
#2 OX	LPA	CO	Performance Test every 3 years	N/A
	HPVGTS	CO	Reactor Inlet Temperature	Reactor Outlet Temperature
	HPVGTS Heater	CO	Completion of tune-ups in accordance with 40 CFR 63 Subpart DDDDD	N/A
#2 PTA	Crystallizer Vent Scrubber	CO	Specialized Performance Test every 5 years	N/A

Table 2.5.2 indicates the monitoring and reporting frequency for the BACT monitoring parameters. For parameters that have a monitoring frequency specified as “continuously with daily average,” at least one data point shall be obtained each 15-minute period and all data points collected within a 24-hour period (during those times that the process or emissions generating equipment was being operated) shall be averaged together for a daily reading for comparison to an established monitoring range. All records of the parameters will maintained for at least 5 years after being recorded.

Table 2.5.2
BACT Monitoring Frequency and Reporting

UNIT	EMISSION POINT	PARAMETER	FREQUENCY	REPORTING
#1 OX	LPA	Scrubbing Liquid Flow	Continuously with daily average	Semiannual
		Scrubber Top Temperature	Continuously with daily average	Semiannual
	HPVGTS	Reactor Inlet Temperature	Continuously with daily average	Semiannual
		Reactor Inlet Temperature	Continuously with daily average	Semiannual
	Equipment Fugitives	HON LDAR Monitoring	Per HON LDAR regulation	Semiannual
#2 OX	LPA	Scrubbing Top Liquid Flow	Continuously with daily average	Semiannual
		Scrubber Top Temperature	Continuously with daily average	Semiannual
	HPVGTS	Reactor Inlet Temperature	Continuously with daily average	Semiannual
		Reactor Inlet Temperature	Continuously with daily average	Semiannual
	Equipment Fugitives	HON LDAR Monitoring	Per HON LDAR regulation	Semiannual
	HPVGTS Heater	Tune-Up	Per 40 CFR 63 Subpart DDDDD	Conduct an initial tune-up before January 16, 2016 and subsequent tune-ups every 5 years because unit has an oxygen-trim system installed that maintains an optimum air to fuel ratio.
#1 PTA	Crystallizer Vent Scrubber	Special Performance Test	Every 5 years	Every 5 years
#2 PTA	Crystallizer Vent Scrubber	Special Performance Test	Every 5 years	Every 5 years

Figure 2-1.1
BP Cooper River Overall Process Flow Diagram

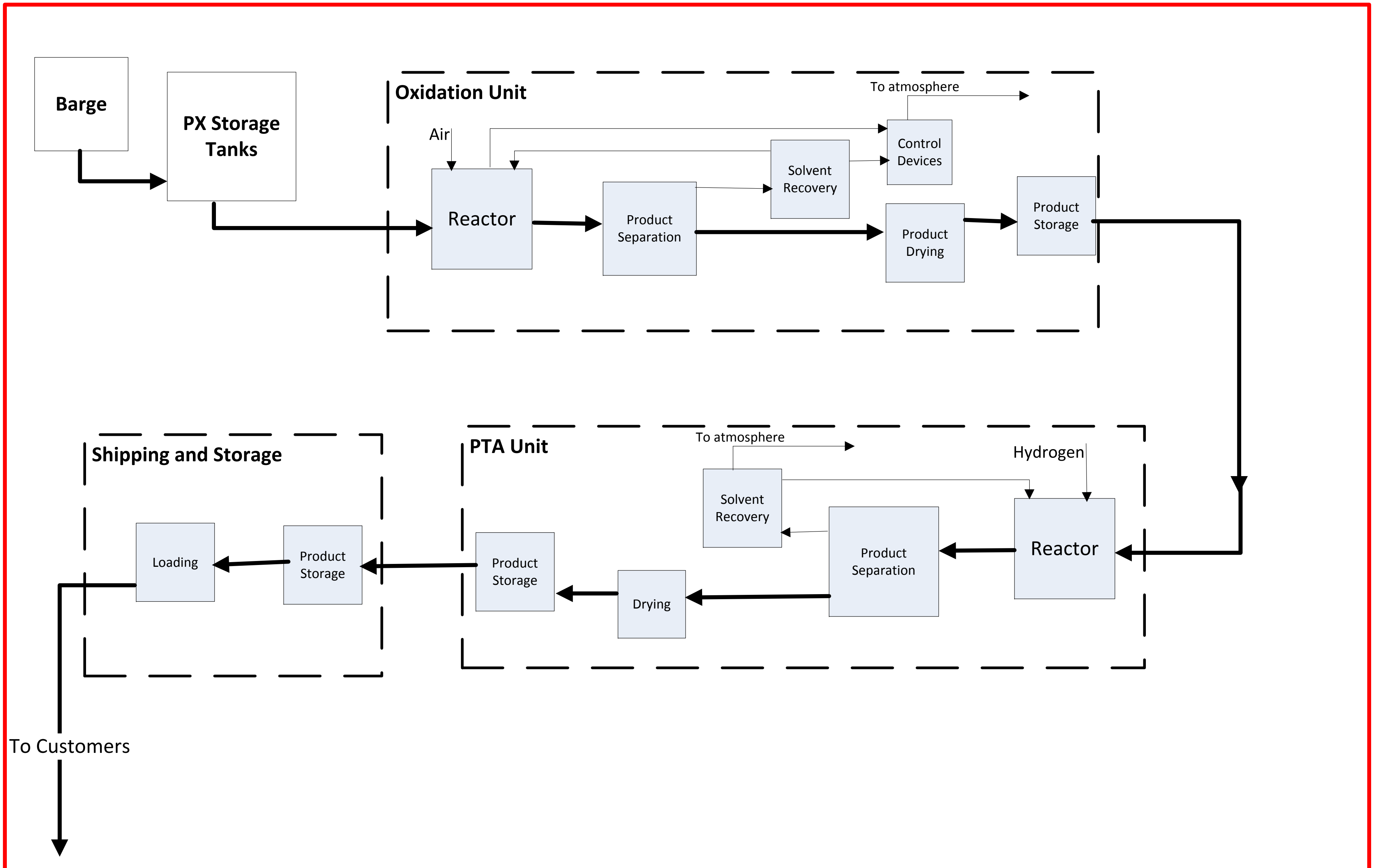

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Figure 2-1.2
#1 OX Unit Existing Process Flow Diagram

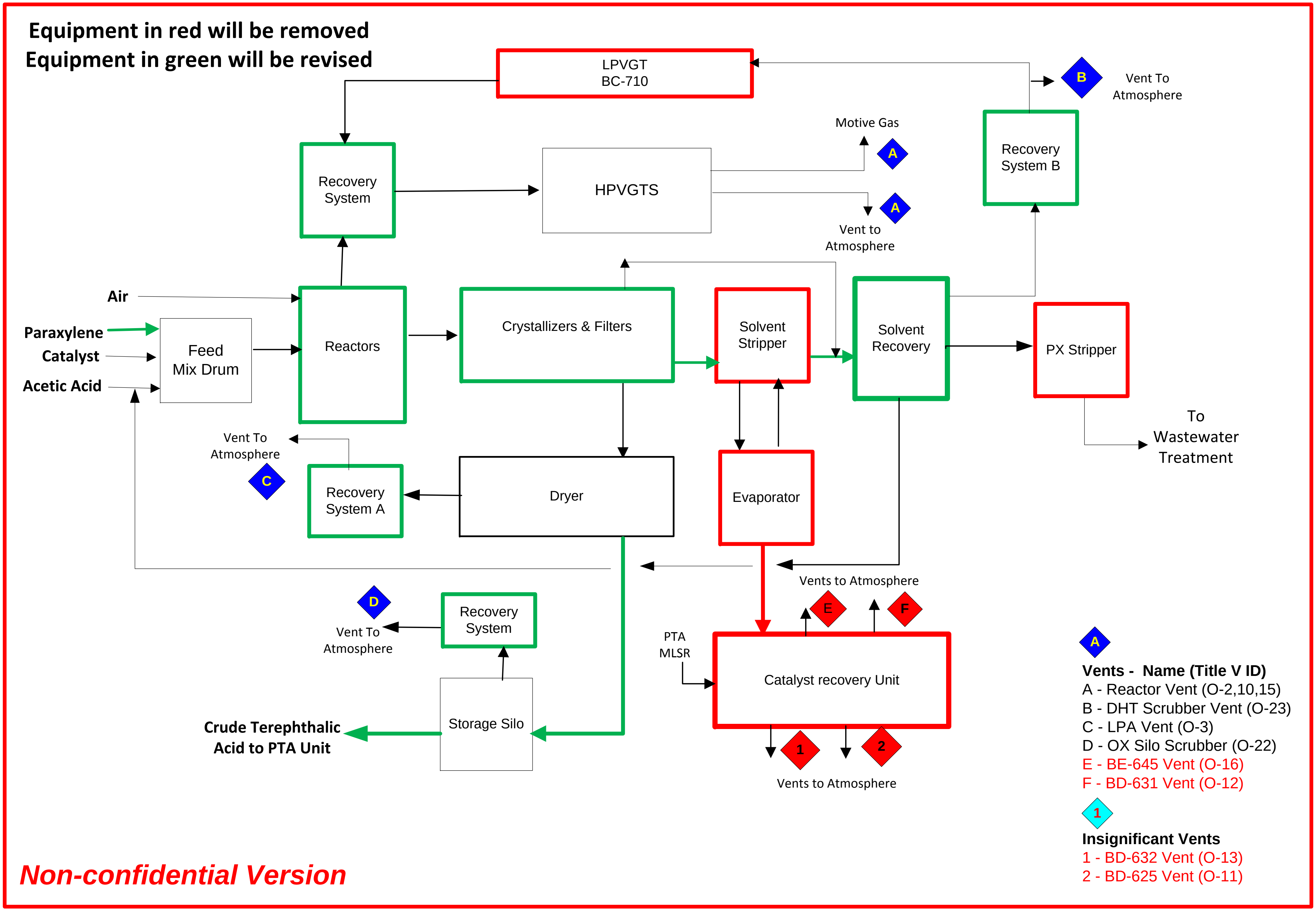

Figure 2-1.3
#1 PTA Unit Existing Process Flow Diagram

Equipment in red will be removed
Equipment in green will be revised

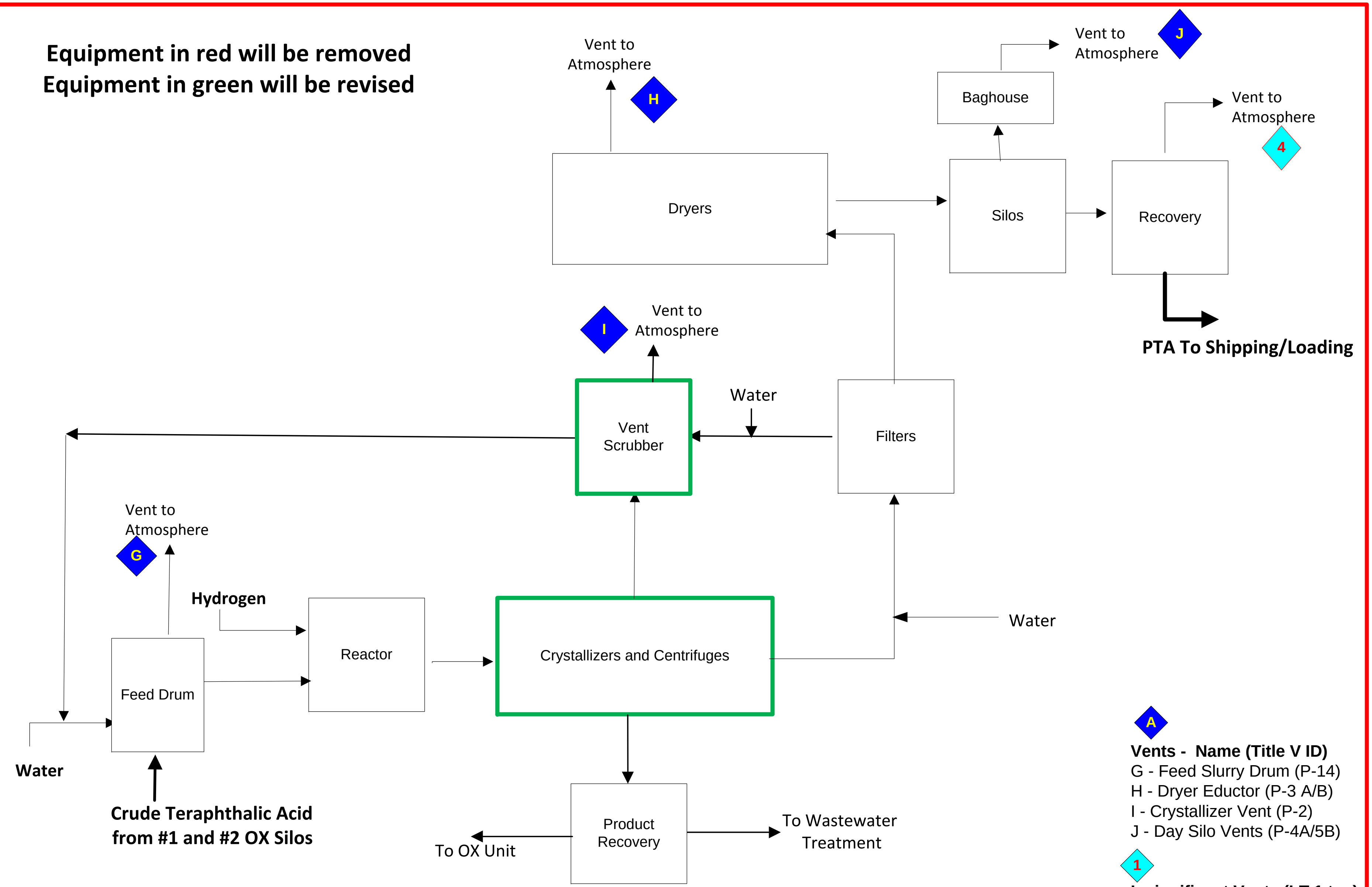

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Figure 2-1.4
#2 OX Unit Existing Process Flow Diagram

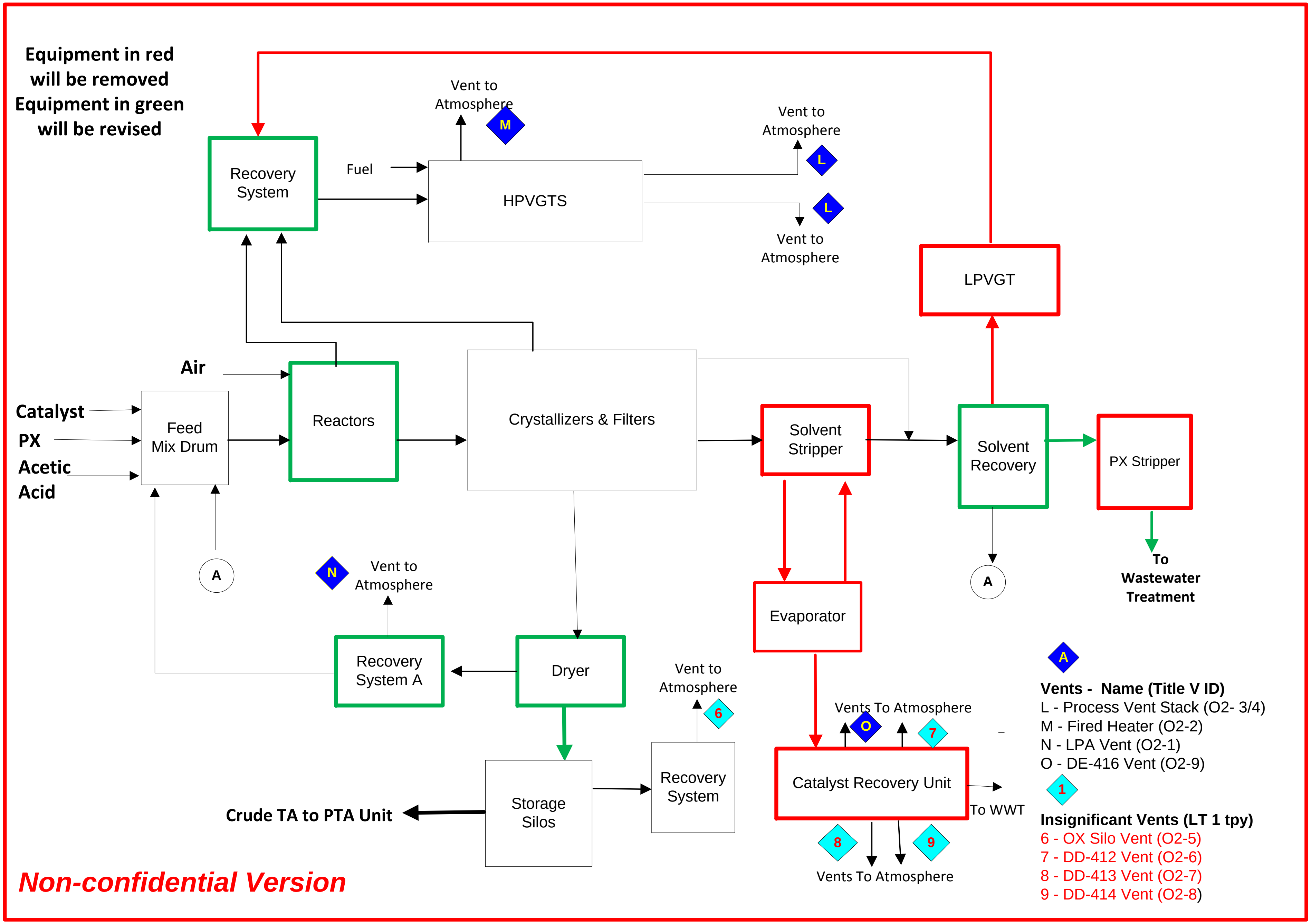


Figure 2-1.5
#2 PTA Unit Existing Process Flow Diagram

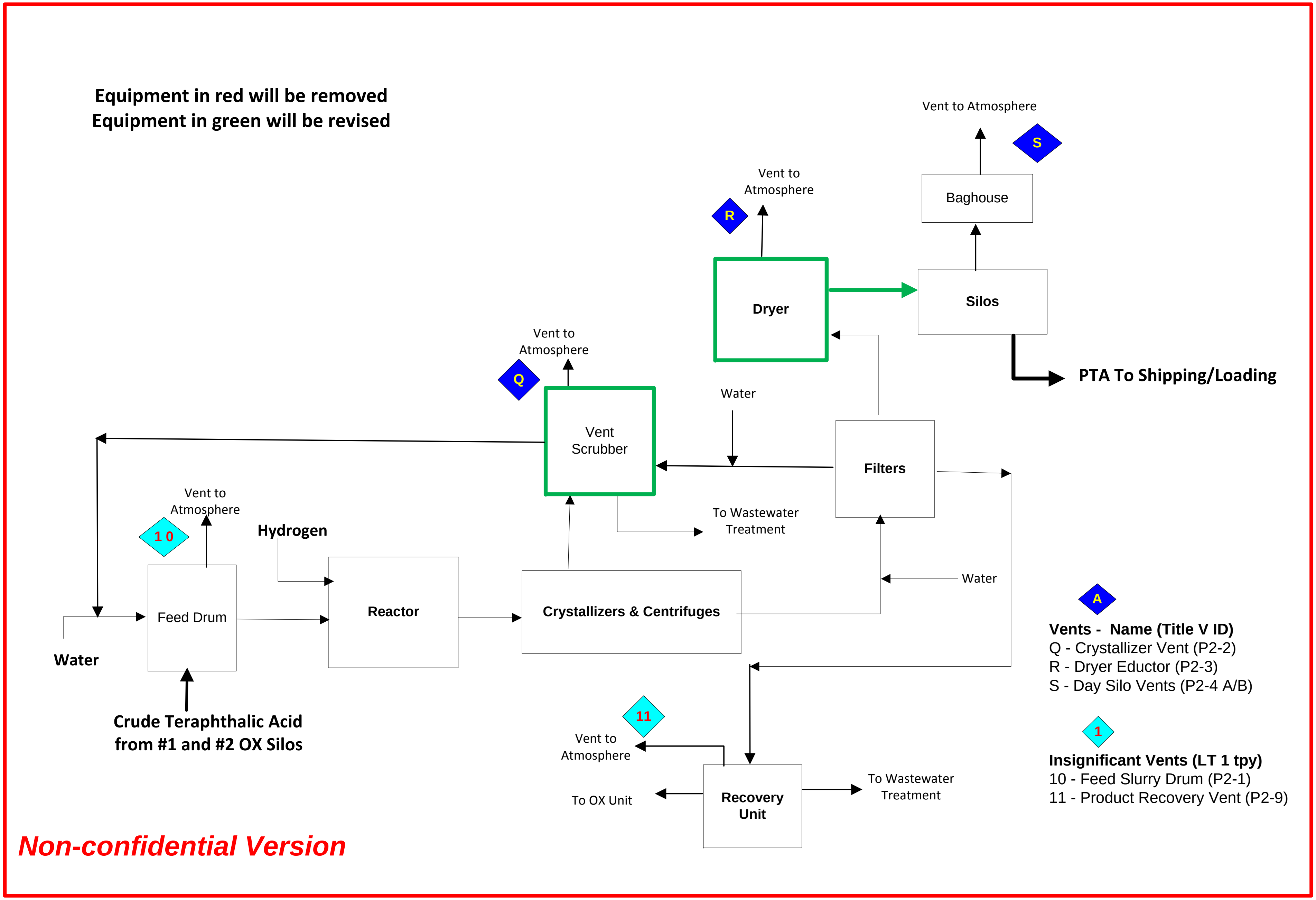


Figure 2-2.1
#1 OX Unit Future Process Flow Diagram

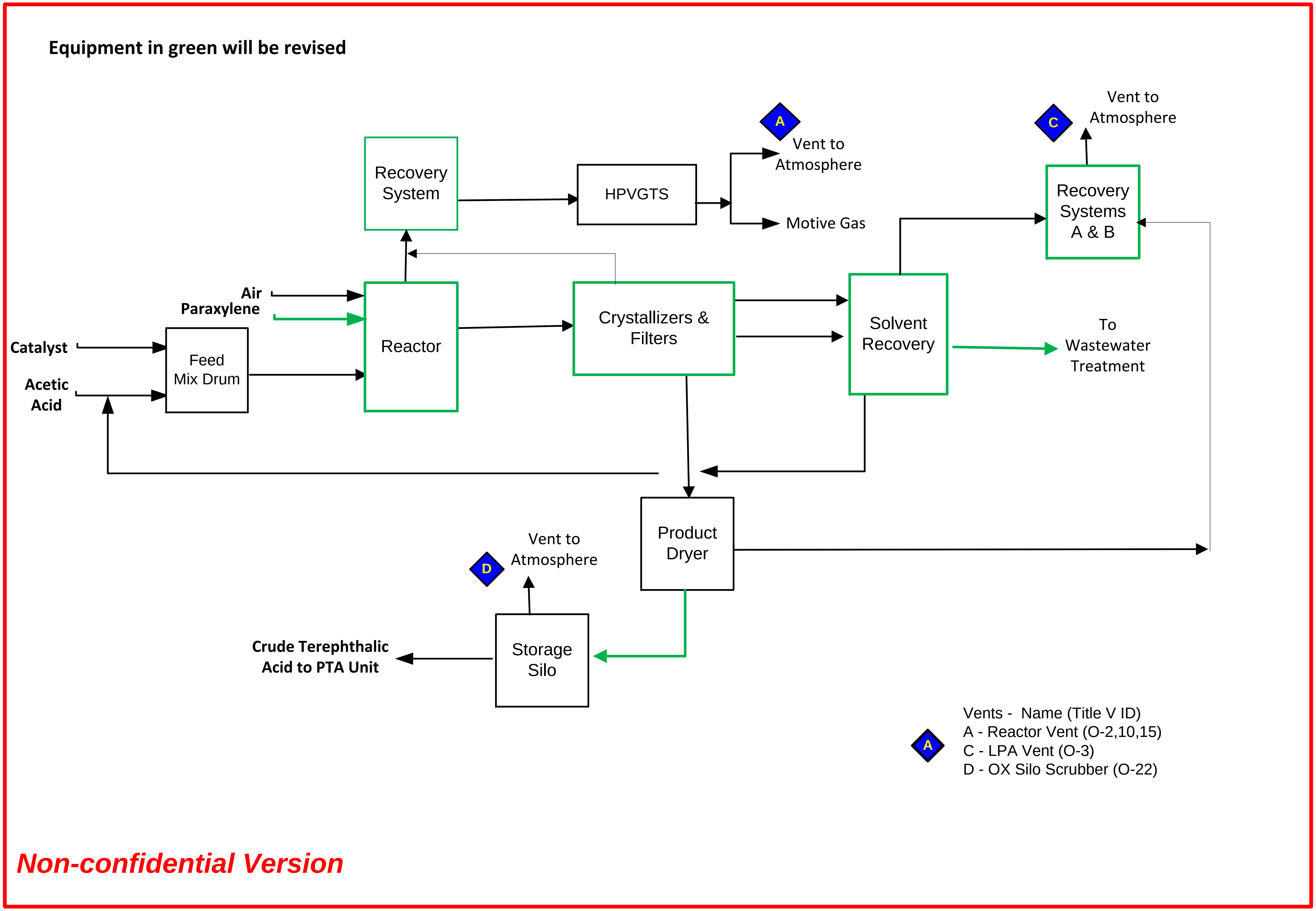


Figure 2-2.2
#1 PTA Unit Future Process Flow Diagram

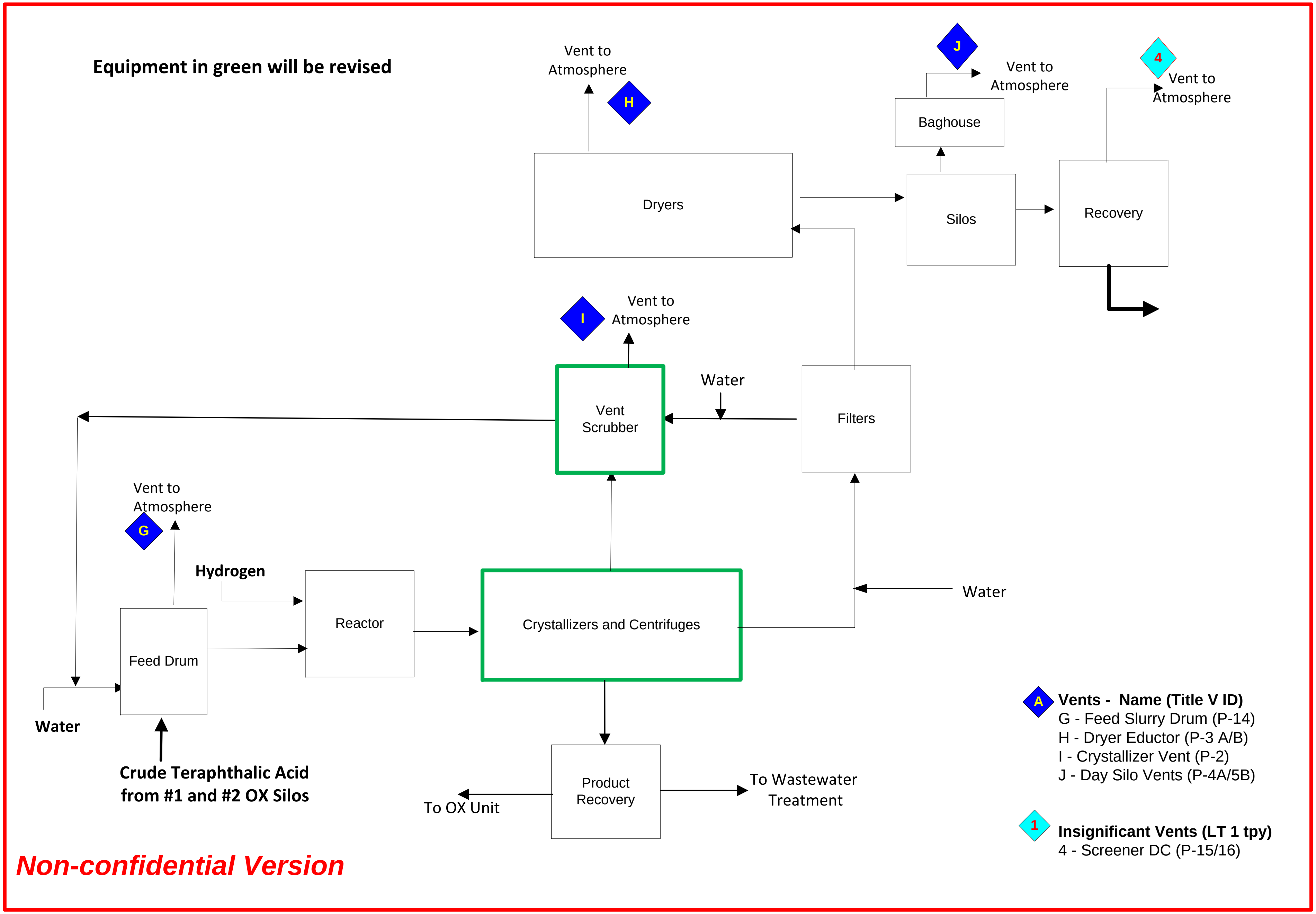


Figure 2-2.3
#2 OX Unit Future Process Flow Diagram

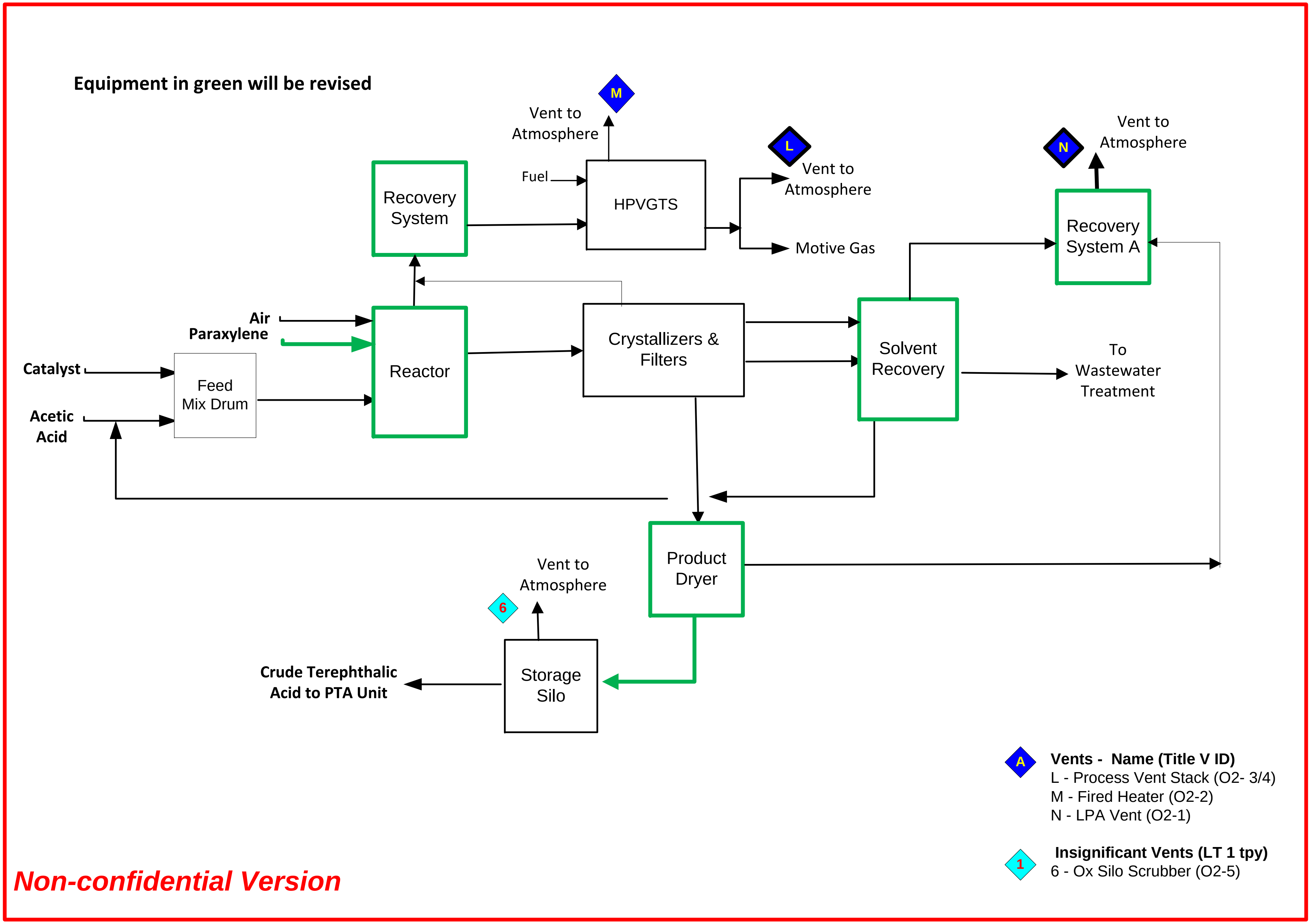
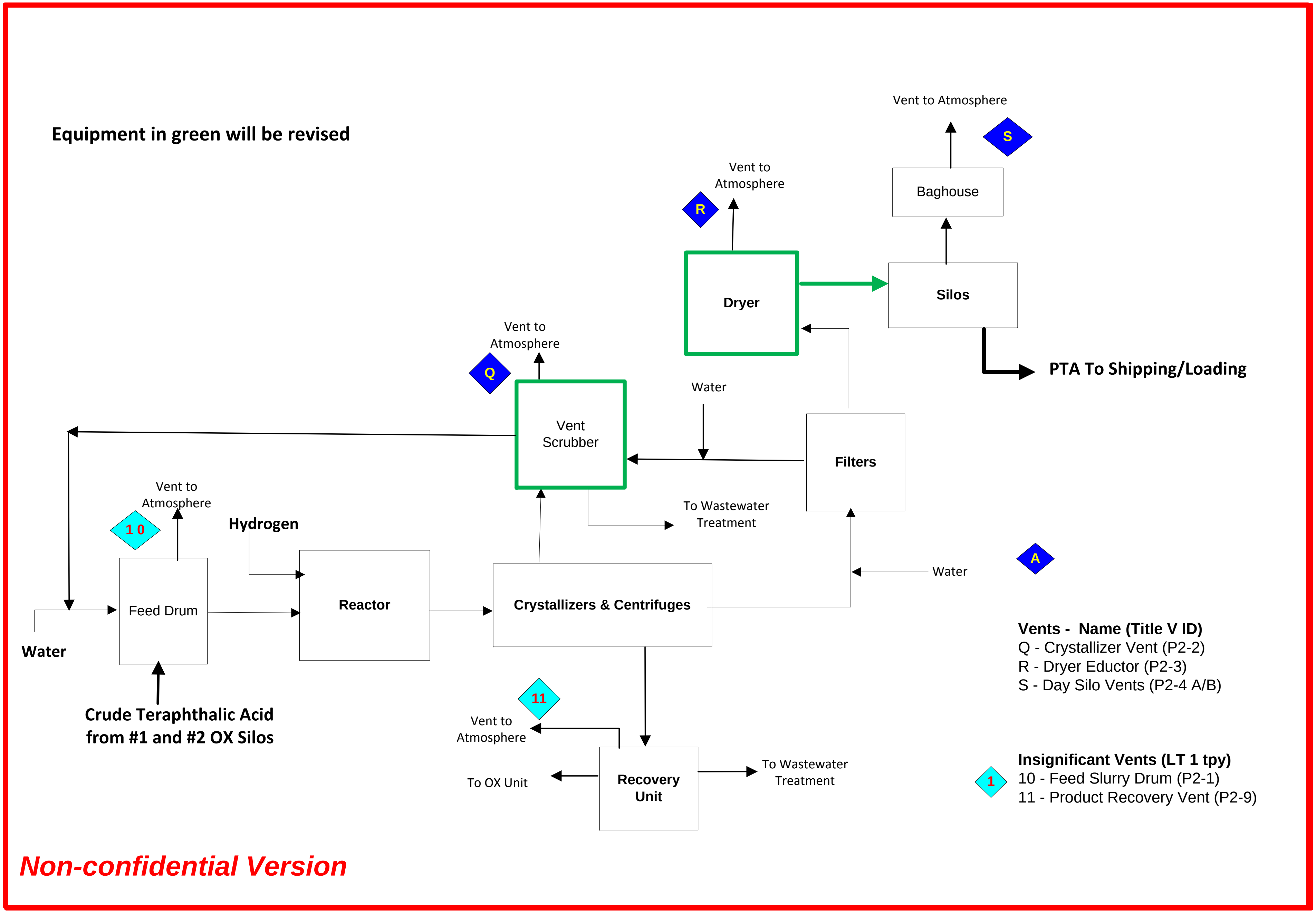


Figure 2-2.4
#2 PTA Unit Future Process Flow Diagram



Section 3
Applicable Regulations

A regulatory assessment was completed for the proposed OX Modernization/Debottleneck Project at the BP CR Plant. A review of both South Carolina and Federal regulations was conducted to determine the applicable air quality requirements for the proposed project. Each potentially applicable regulation is summarized in Table 3-1 and is described in the following subsections and, where applicable, the emissions limits are outlined as well as the required record keeping and monitoring requirements.

3.1 State Regulations

The following state regulations are potentially applicable to this project.

3.1.1 South Carolina Air Quality Rule 61-62.1 Section II - Permit Requirements

This regulation is applicable to the project because it states that any person who plans to construct, alter, or add to a source of air contaminants, including installation of any device for the control of air contaminant discharges, shall first obtain a construction permit from the Department prior to commencement of construction. This application is being submitted to meet this requirement.

3.1.2 South Carolina Air Quality Rule 61-62.5 Standard No. 1

This regulation is applicable to fuel combustion sources and includes emission limits for visible emissions (opacity), SO_2, and PM. This regulation would apply to the heater for the #1 OX HPVGTS. The proposed project will not change any of the existing limits or requirements for the facility.

3.1.3 South Carolina Air Quality Rule 61-62.5 Standard No. 2

This regulation is applicable to the facility. The CO PSD modeling using AERMOD shows the emissions impacts of the project are below the significant impact level. Therefore, no further modeling analysis of emissions for Standard No. 2 is needed.

Table 3-1
Summary of Potentially Applicable Regulation

REGULATORY ASSESSMENT SUMMARY		
POTENTIALLY APPLICABLE REGULATIONS		APPLICABLE TO PROJECT
State (SC DHEC) Regulations		
SC DHEC Reg 61-62.5 Section II	Permit Requirements	Y
SC DHEC Reg 61-62.5 Std. No. 1	Emissions from Fuel Burning Operations	Y
SC DHEC Reg 61-62.5 Std. No. 1	Ambient Air Quality Standards	Y
SC DHEC Reg 61-62.5 Std. No. 3	Waste Combustion and Reduction	N
SC DHEC Reg 61-62.5 Std. No. 4	Emissions from Process Industries	Y
SC DHEC Reg 61-62.5 Std. No. 5.1	BACT/Lowest Achievable Emission Rate (LAER) Applicable to VOCs	Y
SC DHEC Reg 61-62.5 Std. No. 5.2	Control of NO_X	N
SC DHEC Reg 61-62.5 Std. No. 7	PSD	Y
SC DHEC Reg 61-62.5 Std. No. 8	TAPs	Y
SC DHEC Reg 61-62.7	GEP Stack Height	Y
SC DHEC Reg 61-62.60	NSPS	Y
SC DHEC Reg 61-62.61	National Emission Standards for Hazardous Air Pollutant (NESHAP)	Y
SC DHEC Reg 61-62.63	NESHAPs for Source Categories	Y
Federal Regulations		
40 CFR Part 60, Subpart A	General Provisions	Y
40 CFR Part 60, Subpart Da	NSPS for Electric Utility Steam Generating Units	N
40 CFR Part 60, Subpart Db	NSPS for Industrial-Commercial-Institutional Steam Generating Units	Y
40 CFR Part 60, Subpart Kb	NSPS for Volatile Organic Liquid Storage Tanks	N
40 CFR Part 60, Subpart VV	NSPS for Equipment Leaks of VOC in the SOCMI Before November 7, 2006	Y
40 CFR Part 60, Subpart VVa	NSPS for Equipment Leaks of VOC in the SOCMI After November 7, 2006	Y
40 CFR Part 60, Subpart III	NSPS for VOC Emissions from the SOCMI Air Oxidation Unit Processes	Y
40 CFR Part 60, Subpart NNN	NSPS for VOC Emissions from SOCMI Distillation Operations	Y
40 CFR Part 60, Subpart RRR	NSPS for VOC Emissions from SOCMI Reactor Operations	N

Table 3-1
Summary of Potentially Applicable Regulation

REGULATORY ASSESSMENT SUMMARY		
POTENTIALLY APPLICABLE REGULATIONS		APPLICABLE TO PROJECT
40 CFR Part 60, Subpart YYY (proposed)	VOC Emissions from SOCMI Wastewater	Will review when rule finalized
40 CFR Part 60, Subpart IIII	NSPS for Stationary Compression Ignition Internal Combustion Engines	Y
40 CFR Part 61, Subpart M	National Emission Standard for Asbestos	Y
40 CFR Part 61, Subpart V	National Emission Standard for Equipment Leaks (Fugitive Emission Sources)	N
40 CFR Part 61, Subpart FF	National Emission Standard for Benzene Waste Operations	Y
40 CFR Part 63, Subpart A	NESHAPs for Source Categories; General Provisions	Y
40 CFR Part 63, Subpart F	NESHAPs for Source Categories; HON from SOCMI	Y
40 CFR Part 63, Subpart G	NESHAPs for Source Categories; HON from SOCMI for Process Vents, Storage Vessels, Transfer Operations, and Wastewater	Y
40 CFR Part 63, Subpart H	NESHAPs for Source Categories; HON for Equipment Leaks	Y
40 CFR Part 63, Subpart EEEE	NESHAPs for Organic Liquids Distribution (Non-Gasoline)	N
40 CFR Part 63, Subpart ZZZZ	NESHAPs for Stationary RICEs	Y
40 CFR Part 63, Subpart DDDDD	NESHAPs for Industrial, Commercial, and Institutional Boilers and Process Heaters	Y
40 CFR Part 63, Subpart GGGGG	NESHAPs for Site Remediation	Y
40 CFR Part 64	CAM	Y

3.1.4 South Carolina Air Quality Rule 61-62.5 Standard No. 3

This regulation is shown as an applicable regulation for the HPVGTS catalytic oxidation reactor in the existing Title V permit. However, in the Title V renewal application submitted in January 2012, the following justification was provided to remove this as an applicable regulation:

> *The existing Title V permit has both of the HPVGTS reactors subject to the SC DHEC regulation 61-62.5 Standard 3 (Waste Combustion and Reduction). The HPVGTS is not a combustion system as was intended to be covered by this regulation. However, even if the regulation is potentially applicable to the HPVGTS since the outlet of the reactors pass through a liquid scrubber prior to being released to the atmosphere it is not possible for either PM or visible emissions from the reactor to be emitted. We request that SC DHEC either agree that the regulation is not applicable to the HPVGTS or that it be exempted since the pollutants of potential concern cannot be emitted by the system.*

3.1.5 South Carolina Air Quality Rule 61-62.5 Standard No. 4

The #1 OX/PTA and #2 OX/PTA units have emissions that are subject to this standard. All emission sources, including any fugitives, are subject to 20 percent opacity and PM limits under this standard. The proposed project does not change the process weight for any unit so it does not change any limits or create any new requirements for the affected units under this regulation.

3.1.6 South Carolina Air Quality Rule 61-62.5 Standard No. 5.1

This standard applies to the site overall. Since the net VOC emissions increase is less than 100 tons per year (tpy), this regulation has no applicable requirements for this project. However, since the net VOC emission increase exceeds the PSD threshold, a VOC BACT analysis has been completed for this PSD permit application and is included in Section 4 of the application.

3.1.7 South Carolina Air Quality Rule 61-62.5 Standard No. 5.2

This standard does not apply to this project since no new fuel combustion source is being built and none of the existing fuel combustion sources burners are being replaced in this project.

3.1.8 South Carolina Air Quality Rule 61-62.5 Standard No. 7

This standard will apply to this project since the facility is a PSD major source and the net emissions increase for at least one PSD pollutant exceeds the PSD threshold. This application is for a PSD permit for the pollutants exceeding the threshold. The results of the PSD analysis are shown in Table B-1 in Appendix B.

3.1.9 South Carolina Air Quality Rule 61-62.5 Standard No. 8

This standard would be applicable to the project since the units are a source of toxic air pollutants (TAPs). However, since both the OX and PTA units are subject to the HON Maximum Achievable Control Technology (MACT) regulation they are exempt per Standard No. 8 Section I (D) from the regulation. Therefore, air toxics modeling of the revised facility is not required by the regulation.

3.1.10 South Carolina Air Quality Rule 61-62.7

This regulation requires all emissions stacks to be in compliance with good engineering practice (GEP) provisions. All stacks have previously been assessed for compliance with GEP provisions and this project will not change any of the stacks.

3.1.11 South Carolina Air Quality Rule 61-62.60

This regulation is applicable to the project since the affected units are subject to 40 CFR Part 60 regulations that are incorporated by reference in this state regulation. This regulation will be met by the facility meeting the requirements contained in the applicable federal 40 CFR Part 60 regulations. A regulation-specific description of the requirements is contained in subsequent subsections discussing the applicable federal regulations.

3.1.12 South Carolina Air Quality Rule 61-62.61

This regulation is applicable to the unit since the facility in general is subject to 40 CFR Part 61 regulations (Subparts M and FF) that are incorporated by reference in this state regulation. This regulation will be met by the facility meeting the requirements contained in the applicable federal 40 CFR Part 61 regulations. The proposed project does not create any new or revise any requirements for the facility under this regulation.

3.1.13 South Carolina Air Quality Rule 61-62.63

This regulation is applicable to the affected units since they are subject to 40 CFR Part 63 regulations that are incorporated by reference in this state regulation. This regulation will be met by meeting the requirements contained in the applicable federal 40 CFR Part 63 regulations discussed in a later section. The proposed project does subject the units to applicability of any new federal regulations under this regulation. A regulation specific description of the requirements is contained in subsequent subsections.

3.2 Federal Regulations

The following federal regulations are potentially applicable to this project.

3.2.1 40 CFR Part 60, Subpart A

This regulation is applicable to the units and provides general requirements for emissions from source categories. This project will not change the requirements of this regulation to the affected units.

3.2.2 40 CFR Part 60, Subpart Da

This regulation is not applicable to the boilers. They may supply some portion of their steam to the steam turbines being added to the units to generate electricity but it will only be a small portion of their steam capacity and any electricity generated will be for internal use and none will be sold to a third party.

3.2.3 40 CFR Part 60, Subpart Db

This regulation is applicable to the boilers. This project will require incremental steam from the boilers but they will not be modified or increase previously permitted emissions. This project will not add any new or revise any requirements of the regulation.

3.2.4 40 CFR Part 60, Subpart Kb

The new tanks being added to the units to store the NBA or NBA/Butanol/PX mixtures will meet the minimum size to be subject to the regulation. However, the material stored has a vapor pressure at storage temperatures that is less than the minimum vapor pressure (3.5 kPa) needed for the regulation to apply to the new tanks. This regulation is not applicable to this project.

3.2.5 40 CFR Part 60, Subpart VV

The #2 OX and PTA units are subject to the New Source Performance Standard (NSPS) for equipment leaks of VOC in Synthetic Organic Chemical Manufacturing Industry (SOCMI) as set forth in 40 CFR 60, Subpart VV. The #1 OX and PTA units were built before the regulatory applicability date and they have not been modified as defined in the regulation since the applicability date so they are not subject to this regulation. In 2007, BP CR voluntarily agreed to implement a VOC Leak Detection and Repair (LDAR) program equivalent to Subpart VV for the #1 unit as a PSD offset. Neither #1 nor #2 PTA units have any process streams containing over 10 percent VOC content. BP CR is currently in compliance with all requirements of Subpart VV.

The BACT analysis for fugitives in Section 4 concluded that monitoring all equipment leak components according to 40 CFR 63 Subpart H (HON MACT LDAR) would be the applicable BACT. BP will assume that all VOCs are HAPs for determining which components will be part of the HON LDAR program. The use of the single LDAR regulation was concluded to be BACT and will simplify the monitoring program and recordkeeping.

3.2.6 40 CFR Part 60, Subpart VVa

The units are not presently subject to this regulation since they were built before the regulatory applicability date and have not been modified as defined in the regulation since the applicability date. This regulation will be applicable to the units since they will be modified as defined in the regulation after the November 6, 2006 applicability date. However, the facility has chosen an alternative means of compliance within the regulation. The facility will comply with Part 63, subpart H. Owners or operators may choose to comply with the provisions of 40 CFR Part 63, Subpart H, to satisfy the requirements of §§ 60.482-1a through 60.487a for an affected facility. When choosing to comply with 40 CFR Part 63, Subpart H, the requirements of § 60.485a (d), (e), and (f), and § 60.486a(i) and (j) still apply.

3.2.7 40 CFR Part 60, Subpart III

The #2 OX unit reactor is subject to the NSPS for VOC emissions from SOCMI air oxidation units as set forth in 40 CFR 60, Subpart III. The new #1 OX reactor will also be subject to this regulation. The Subpart III total resource evaluation (TRE) is above four after the last recovery device for both units. There are no requirements for this regulation other than to keep track of potential changes in the TRE per 40 CFR 60.610(c).

3.2.8 40 CFR Part 60, Subpart NNN

The #2 OX DHT is presently subject to the NSPS for VOC emissions from SOCMI distillation operations as set forth in 40 CFR 60, Subpart NNN. An additional NNN operation (Entrainer Recovery Tower) will be added to the unit with this project. This new distillation tower will vent to the same recovery system as the #2 OX DHT recovery system. The NNN TRE after the last recovery device in the distillation tower vent system will be above eight so there will be no requirements for this regulation other than to keep track of potential changes in the TRE.

The modifications to the #1 OX DHT will cause it to be subject to this regulation. An additional NNN operation (Entrainer Recovery Tower) will be added to the unit with this project. This new distillation tower will vent to the same recovery system as the #1 OX DHT recovery system. The NNN TRE after the last recovery device in the distillation tower vent system will be above eight so there will be no requirements for this regulation other than to keep track of potential changes in the TRE.

3.2.9 40 CFR Part 60, Subpart RRR

The regulation specifies that it is applicable to reactors, excluding reactor processes using air as a reactant, that produce one of the chemicals listed in the regulation. However, the PTA unit reactors do not produce a chemical but only purify a chemical produced in the OX unit reactor which is subject to Subpart III.

3.2.10 40 CFR Part 60, Subpart YYY

This regulation has been proposed but has not been finalized. When the regulation is finalized, the applicability to the units and the regulatory requirements will have to be assessed at that time.

3.2.11 40 CFR Part 60, Subpart IIII

The replacement BM-1201 Emergency Generator and the new BM-1204 Emergency Generator will be subject to this regulation and will need to comply with its requirements for a Tier 3 engine in 40 CFR 89.112 and 89.113. It will also require a non-resettable hour meter and the use of diesel fuel with a sulfur limit of 15 ppm. None of the other Reciprocating Internal Combustion Engines (RICE) associated with the affected units are subject to this regulation since they were purchased prior to the regulatory applicability date.

3.2.12 40 CFR Part 61, Subpart M

The facility has asbestos-containing materials (ACM) on the site that must be handled in accordance with this regulation. This project will not change the requirements of this regulation to the facility. Any ACM that is removed or disturbed during the project will be handled in accordance with this regulation.

3.2.13 40 CFR Part 61, Subpart V

The facility is not subject to this regulation since it is not subject to any of the Part 61 subparts that reference this regulation.

3.2.14 40 CFR Part 61, Subpart FF

The total annual benzene (TAB) quantity from facility waste has historically been less than 1 megagrams per year (Mg/yr). This project will not cause the facilities TAB to be greater than 1 Mg/yr. This project will not change the applicable requirements to the facility.

3.2.15 40 CFR Part 63, Subpart A

This regulation is applicable to the unit and provides general requirements for the control of HAPs emissions in various regulations under 40 CFR 63. This project will not change the requirements of this regulation that are applicable to the units.

3.2.16 40 CFR Part 63, Subpart F

This regulation is applicable to the units and provides general requirements for HAP emissions from SOCMI sources. This project will not change the requirements of this regulation to the unit.

3.2.17 40 CFR Part 63, Subpart G

The #1 and #2 OX and PTA units are subject to the requirements of Subpart G as set forth in 40 CFR Part 63. These units are subject to the process vent and wastewater provisions of Subpart G with all the existing sources being HON Group 2 sources. BP CR is currently in compliance with all requirements of Subpart G. The modifications to the units will not constitute reconstruction as defined in the MACT regulations since the total cost of the project will be substantially less than the 50 percent replacement cost threshold. Therefore, the #1 units will remain existing sources and the #2 units will continue as new sources.

This project will create some new HON process vents that will also be Group 2 vents and remove some existing HON process vents. This project will also add some new tanks that will all be Group 2 storage tanks.

3.2.18 40 CFR Part 63, Subpart H

The #1 and #2 OX and PTA units are subject to the requirements of Subpart H as set forth in 40 CFR Part 63. BP CR is currently in compliance with all presently applicable requirements of Subpart H. However, based on the BACT determination for fugitives and in order to simplify the LDAR program BP will expand this regulations' applicability by including all components that meet the 5 percent HAP content requirement for inclusion by considering all VOC as HAPs for the LDAR program determination.

3.2.19 40 CFR Part 63, Subpart EEEE

The regulation would potentially be applicable to some sources at the facility but they are all subject to the HON regulations. Hence, they are all excluded from this regulation and there are no requirements under this regulation.

3.2.20 40 CFR Part 63, Subpart GGGGG

This regulation is applicable to remediation at the site. There is currently no ongoing remediation at the site. However, if any events occur at the site that trigger remediation, the requirements of this regulation will be applied.

3.2.21 40 CFR Part 63, Subpart ZZZZ

The RICEs associated with the units are subject to this regulation. All the subject engines are diesel-powered combustion ignition engines and do not have any applicable emission standards but have work practice standards to meet. The replacement BM-1201 Emergency Generator and the new BM-1204 Emergency Generator only need to comply with the initial notification requirements of this regulation per 40 CFR 63.6590(b)(1).

3.2.22 40 CFR Part 63, Subpart DDDDD

The boilers and #2 OX-HPVGTS heater are subject to the requirements for HAP emissions as set forth in 40 CFR 63, Subpart DDDDD. The Title V renewal application submittal has requested a permit revision to limit the boilers to burning gaseous fuels and would only burn liquid fuel during a gas curtailment or for no more than 48 hours per year for testing. The boilers will meet the requirements for a gas-fired boiler. The

#2 HPVGTS heater only burns gas and will meet the requirements for a gas-fired heater. This project will not change the requirements of this regulation to the sources.

3.2.23 40 CFR Part 64

This regulation specifies the requirements for monitoring to assure compliance with emission limits for applicable pollutant specific emission units. The facility has received a Title V renewal permit including required compliance assurance monitoring (CAM) conditions. The present CAM will be revised, as necessary, to reflect the changes in the process flow and control schemes.

Section 4
Best Available Control Technology Analysis for Volatile Organic Compound Emissions and Carbon Monoxide

4.1 Control Technology Information

The following is a brief description of each of the control technologies that will be considered in at least one of the BACT analysis to follow. The possible control efficiency for each technology shown in the following descriptions is the upper range for each technology and may not be possible but has been assumed for BACT purposes (*i.e.*, an RTO may not be able to achieve 99 percent in practice).

- **Thermal Oxidizer (TO)** –A TO is a controlled combustion technology for air pollution control of a gaseous stream. Fuel and air are added to a combustion chamber through which the exhaust gases pass to maintain a high minimum operating temperature and decompose the VOC and CO into carbon dioxide (CO2) and water (H2O) before releasing them to the atmosphere. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a TO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact.
- **Regenerative Thermal Oxidizer (RTO)** – This control technology is similar to a TO in the manner it controls the VOC and CO emissions. The difference in the RTO versus a TO is the energy efficiency it achieves by storing heat in ceramic media as the process stream enters and exits the combustion chamber. The directions of the airflow is reversed every 1 to 3 minutes by a series of valves to alternately store and regenerate the heat – the inlet process stream gets pre-heated and the outlet process stream gives up the heat. The result is a more energy efficient operation than a TO. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a RTO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact.
- **Recuperative Thermal Oxidizer (RCO)** – This control technology is similar to a TO in the manner it controls the VOC and CO emissions. The difference in the RCO versus a TO is the energy efficiency it achieves by a primary and/or secondary heat exchanger within the system. A primary heat exchanger preheats the incoming vent stream by recuperating heat from the exiting treated stream. As the incoming air passes on one side of the exchanger heat is transferred to it through the process of conduction from the hot clean air from the

combustion chamber passing on the other side of the exchanger. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a RCO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact.

- **Catalytic Thermal Oxidizer (CTO)** – This control technology decomposes the VOC and CO into CO2 and water at lower temperatures than a TO in the presence of a catalyst to promote the reaction. The lower temperatures will reduce the amount of supplemental heat required for the process and reduce possible natural gas combustion emissions. Catalytic oxidation occurs through a chemical reaction between the VOC hydrocarbon molecules and a precious-metal catalyst bed that is internal to the oxidizer system. A catalyst is a substance that is used to accelerate the rate of a chemical reaction, allowing the reaction to occur in a much lower normal temperature range. This technology has a possible control efficiency of 99 percent for VOC and 95 percent for CO. The operation of a CTO will result in an increase in pollutants from natural gas combustion, specifically nitrogen oxides, which is an added environmental impact. An additional disadvantage is the disposal of the spent catalyst. Depending on the catalyst type, the spent catalyst may require disposal in an approved hazardous waste disposal site.

- **Flare** – A gas flare, alternatively known as a flare stack, is an open air gas combustion device used for burning off flammable gas that will be released to the atmosphere. The vent stream being treated must contain a minimum British thermal units/standard cubic feet (Btu/scf) value to maintain combustion or a supplemental fuel must be added to meet the minimum. The control requirements in 40 CFR 60.18 states a flare shall only be used as a control device if the vent stream being combusted has a net heating value of at least 200 Btu/scf. This is to prevent very low Btu vent streams from blowing out the flare flame. This technology has a possible control efficiency of 98 percent for VOC. This control technology has a disadvantage of potentially producing as many CO emissions as it would destroy so it may not be a feasible technology for CO control.

- **Boiler** – A boiler can be used as a air pollution control device by feeding the air stream containing the contaminants to be destroyed into the flame. The boiler then operates similar to a thermal oxidizer to destroy the pollutants.

- **Absorber/Scrubber** – Absorber/Scrubber systems are air pollution control devices that can be used to remove some particulates and/or gases from industrial exhaust streams. This process works via the contact of contaminants with the absorbing/scrubbing solution to remove the contaminants from the vent stream. The process uses rapid gas absorption by use of pressure drop and excellent gas and liquid distribution either mechanically or physically to remove the contaminants. Solutions may simply be water (for dust) or solutions of reagents that specifically target certain compounds. Gas enters at the bottom of the absorber and is contacted in a countercurrent fashion in' the absorption section by the scrubbing liquid that is sprayed into the top of the scrubber. The gas stream passes upward in the tower through a mist eliminator where entrained droplets are removed before the exhaust gas enters the stack. The scrubber solution is collected in the bottom of the tower where most of the scrubbing solution is recycled to the top of the tower. A small amount of scrubber solution is bled to remove the scrubbed VOC and to allow for the addition of fresh scrubbing liquid. This technology has a possible control efficiency of 95 percent for VOC but will not control CO emissions. The operation of an absorber/scrubber will result in an increase of a spent scrubbing solution that must be treated before being disposed.

- **Adsorber** – An adsorber removes contaminants by adsorbing them onto a solid material, such as activated carbon, that has a high surface area and is used to capture a gas or liquid. The adsorbed material can then be removed by steam or combustion and the carbon reused. This technology has a possible control efficiency of 98 percent for VOC but will not control CO emissions. The operation of an absorber/scrubber will result in an increase of a solid waste (spent carbon) that must be treated before being disposed

- **Condenser** – A condenser is a device or unit used to condense a substance from its gaseous to its liquid state, typically by cooling it. In so doing, the latent heat is given up by the substance, and will transfer to the condenser coolant. Condensers are typically heat exchangers which have various designs and come in many sizes ranging from rather small (hand-held) to very large industrial-scale units used in plant processes. The condensed liquid can be recovered or recycled. This technology has a possible control efficiency of range of 50 to 90 percent for VOC depending on the concentration and VOC compounds present in the stream but will not control CO emissions.

- **Bio-Filtration** –Bio-filtration is a pollution control technique using living material to capture and biologically degrade process pollutants. The air flows through a packed bed and the pollutant transfers into a thin biofilm on the surface of the packing material. Microorganisms, including bacteria and fungi are immobilized in the biofilm and degrade the pollutant. The presence of compounds that are not water soluble will lower the system efficiency. One of the main challenges to optimum bio-filter operation is maintaining proper moisture throughout the system. The air is normally humidified before it enters the bed with a watering (spray) system or a humidification chamber. A bio-filter system is sensitive to the temperature of the incoming air stream.

4.2 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from Low Pressure Absorbers

The OX unit LPA is a recovery device for several process streams in the unit. The LPA recovers the acetic acid in the inlet streams and recycles it into to the process so it eventually reaches the reactor system. This is a valuable material that acts as the solvent for the process and any loss from the LPA outlet must be replaced by purchase of fresh acetic acid. Part of the optimization of the manufacturing process is to minimize the loss of acetic acid.

This project plans to remove the compressor on the DHT overhead stream (LPVGT) and route the DHT overhead through an acetic acid scrubber and then to the LPA. The LPA operates at about 5 inches water (H_2O) pressure and is estimated to recover over $1,000,000 per year of valuable process solvents.

The PTE VOC emissions from the LPA will be 42.0 tpy for #1 OX LPA and 38.8 tpy for #2 OX LPA. The LPA outlet stream will require a fan to raise the pressure sufficiently to allow the stream to go to a control device. This analysis will be based on add-on controls to the outlet of the LPA recovery device.

4.2.1 Identification of Control Technologies

The reasonably available control technology (RACT), BACT, LAER Clearinghouse (RBLC) database was queried for emission sources and control devices of VOC that are used in the process types 64.000, 64.003 and 64.999, SOCMI production. The results of the RBLC search are shown in Appendix C. The search returned several facilities and processes for BACT in these industrial categories. The following control devices were identified from the search as potential add-on controls to the LPA outlet:

- Absorber/Scrubber
- Condenser
- Flare
- Bio-filtration
- TO
- RTO
- Boilers

In the RBLC, no control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAP standards. The results of this review indicated that the following control equipment may be effective in the reduction of VOCs:

- Adsorber
- RCO
- CT

A BACT analysis was performed for each of the control equipment options. The processes currently do not have any add-on controls after the LPA.

4.2.2 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were all determined to be technically feasible for control of VOC:

1. TO
2. RTO
3. RCO
4. CTO
5. Absorber/Scrubber
6. Carbon Adsorber
7. Condenser
8. Flare
9. Bio-filtration

The use of the existing boilers as a control option is technically infeasible because the presence of methyl bromide in the stream would cause severe corrosion problems with the carbon steel boilers making them an unacceptable control option. Also the large volume of essentially inert gas (a heating value of less than 5 Btu/scf) would require a large volume of supplemental fuel and air to treat the stream which the boilers would be unable to handle.

The thermal options (TO, RTO, RCO, CTO and flare) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. The recovery options (absorber/scrubber, carbon adsorber and condenser) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process.

The bio-filtration control option would be feasible since it is used for the control of VOCs in other situations similar to this process. However, it would have a lower control efficiency for the LPA process due to the presence of methyl bromide which is used as a biocide and many VOC compounds that are not water soluble which will lower their destruction efficiency. The presence of halogens and other materials that would acidify the water upon degradation makes a trickling bio-filter a better bio-filter option to treat this stream based on comments on the last page in the USEPA document *USING BIOREACTORS TO CONTROL AIR POLLUTION* EPA-456/R-03-003.

All the technically feasible will require the addition of equipment to raise the pressure on the LPA outlet to allow it to flow through any of these control devices. Also any VOC or organics recovered/ captured by the recovery options would not be able to be recycled to the process since the materials would be contaminants for the process and be detrimental to the operation. Therefore, additional control equipment will be required to treat the recovered material. The addition of an absorber/wet scrubber to the outlet of the LPA while being feasible will have much lower removal efficiency than a normal scrubber since the stream is already being treated in the LPA which is a two-stage absorber system.

A detailed economic analysis of the technically feasible options has been performed and is summarized in the following subsections.

4.2.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and United States Environmental Protection Agency (USEPA) documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	99
RTO	99
RCO	99
CTO	98
Flare	98
Carbon Adsorption/TO	96
Bio-filtration	57
Refrigerated Condenser	55
Absorber/Scrubber	50

4.2.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

Economic Analysis

The economic analysis is composed of a calculation of the control technologies' average cost effectiveness (ACE) based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets. The bio-filter information was also based on the USEPA* document USING *BIOREACTORS TO CONTROL AIR POLLUTION* EPA-456/R-03-003 and *Handbook of Environment and Waste Management: Air and Water Pollution*, Hung, Shammas, Wang, World Scientific. 2012. The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The baseline VOC emissions from #1 OX LPA are estimated at 42.0 tpy and #2 OX LPA as 38.8 tpy. The #1 OX LPA emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for each specific control option. This emission rate would be representative for both #1 OX LPA and #2 OX LPA since the ratio of the flow rate impact on equipment costs and emission rates were both about 92 percent. Since the #1 emission rate is higher it would give the lowest ACE values for determining if any of the control technologies were economically feasible.

The ACE can be estimated from the capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. As an example ACE calculation, assume the control efficiency of an option is 99 percent. The (baseline emission rate-control option emission rate) for each option is equal to {42.0 tpy – [42.0 tpy X (1-99%)]} or 41.6 tons on an annual basis. This emission rate is used to determine the ACE for the specific control option.

Table 4-1 provides a summary of the annualized operating cost and average cost effectiveness for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

All the technically feasible will require additional equipment to raise the pressure on the LPA outlet, which is almost at atmospheric pressure, to allow it to flow through any of the add-on control devices. The installation of the additional equipment to increase the pressure of the process stream (*i.e.*, fan/blower) to allow it to flow through a control device will in turn increase the capital cost for the proposed configuration.

Also any VOC or organics recovered / captured in a recovery option (carbon adsorption, condenser or scrubber) system would not be able to be recycled to the process since the materials would be contaminants for the process and be detrimental to the operation. Therefore, a secondary control device would be necessary to destroy the contaminants released during the carbon regeneration cycle or in the liquid streams from the condenser or absorber.

The use of a direct flame oxidizer (TO, RTO or RCO) for a stream containing a halogen compound (methyl bromide) is not recommended because of the formation of highly corrosive acid gases per USEPA technology fact sheets (see Appendix H) in a direct flame incinerator at the high temperatures. They would at least require an upgrade to their metallurgy to stainless steel. The CTO would not be affected by the halogens since it is not a direct flame incinerator and operates at lower temperatures.

Table 4-1
LPA VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST ($)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/ton)	INCREASED ENERGY USAGE ($/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	41.6	$797,659	$535,524	$12,873	$344,412	Yes
RTO	41.6	1,289,233	464,581	11,168	188,922	Yes
RCO	41.6	1,551,405	500,627	12,034	97,422	Yes
CTO (New)	41.2	1,151,592	375,878	9,123	100,324	Yes
Existing HPVGTS (CTO)	41.2	830,431	1,062,446	25,788	625,604	Yes
Flare	41.2	885,255	2,925,574	71,010	2,728,146	Yes
Carbon Adsorber/TO	40.4	1,123,632	491,516	12,166	14,811	Yes
Bio-filtration	23.9	999,036	198,756	9,402	7,600	No
Refrigerated Condenser	23.1	494,237	367,259	15,900	17,050	Yes
Absorber/Scrubber	21.0	637,990	425,373	20,233	3,789	Yes

The ACE value for the options discussed above are high enough per ton of VOC removed, to not be economically feasible. A comparison to recent South Carolina PSD permit application for AGY-Aiken, LLC shows that ACE values in the range of $5,760 to $9,031 were deemed not cost effective for control of VOC. The energy and environmental factors need to be considered for the options to determine the appropriate BACT technology.

Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. The carbon adsorption will require additional fuel to produce the regeneration steam and the natural gas for the combustion device to control the VOC emissions during the regeneration. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, RCO, and CTO control options results in significant increases in energy usage from powering fans with electricity to heating the vent streams with natural gas. The scrubber option generates a large volume of wastewater that would need to be treated. Thermal options (TO, RTO, and RCO) will also generate more products of combustion such as greenhouse gases (GHG), CO, and NO_X that make these control options less environmentally beneficial. The CTO option will generate more GHG and NO_X making it a poor choice for BACT considering the ACE for this option is high. The condenser option will create a large volume of liquid waste that will need to be treated prior to discharge. The proposed technically feasible options are not environmentally beneficial and in all cases create byproducts such as wastewater and secondary air emissions.

4.2.5 Selection of Best Available Control Technology

Based on the economic, energy, and environmental impacts associated with the technically feasible control options, BP has concluded that the proper operation of the LPA recovery system is BACT and no add-on control technology to the LPA outlet is justified. BP proposes a BACT limit for VOC emissions from the #1 OX LPA of 9.6 lbs/hr based on a 3-hour average and #2 OX LPA of 8.9 lbs/hr based on a 3-hour average. This process vent will be subject to CAM monitoring and will be monitored in accordance with the existing CAM plan to demonstrate compliance with the BACT limits. The details of the monitoring are listed in Subsection 2.5 of this application. If performance testing is required the VOC emissions will be determined every 36 months in accordance with either Method 18 or 25A.

4.3 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from High Pressure Absorbers

The OX unit reactor temperature is controlled by boiling off some of the liquid in the reactor. This vapor stream goes through several stages of condensing, with the condensed liquid being returned to the reactor, before the reactor overhead is sent to the recovery system. This recovery system consists of an acetic acid scrubber and then the HPA. This analysis will be based on add-on controls to the outlet of the HPA recovery device.

Presently the outlet of the HPA is sent to the HPVGTS where the pollutants (VOC, CO, and HAPs) are controlled in a catalytic oxidation reactor and a bromine scrubber before the stream is exhausted to either the inert gas system for use as a carrier gas for the conveying system or the expander for power recovery prior to being exhausted to the atmosphere. The carrier gas for the conveying system must not contain over 5 percent oxygen to avoid explosive conditions in silos with the PTA dust. Therefore, any thermal control technology that requires additional air for the control option would have to provide an alternative inert carrier gas (*e.g.*, nitrogen).

The PTE VOC emissions from the HPA will be 1,025.0 tpy for #1 OX HPA and 765.0 tpy for #2 OX HPA.

4.3.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type Process Vents (emissions from air OX, distillation, and other reaction vessels), Organic Chemical production. The results of the RBLC search are shown in Appendix C. The search returned nine facilities and 33 processes for BACT in this industrial category. The following control devices were identified from the search:

- Absorber/Wet Scrubber
- Condenser

– TO

– RTO

– Flare

No control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAPs standards. The results of this review indicated that the following control equipment may be effective in the reduction of VOCs:

– Adsorber

– RCO

– CTO

– Boilers

– Bio-filtration

A BACT analysis was performed for each of the control equipment options. The processes currently utilize a CTO as the add-on control device.

4.3.2 Elimination of Infeasible Control Options

The control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were all determined to be technically feasible for control of VOC:

1. Absorber/Wet Scrubber
2. Adsorber
3. TO
4. RTO
5. RCO
6. CTO (existing HPVGTS)
7. Condenser
8. Bio-filtration

The use of the existing boilers as a control option is technically infeasible because the presence of methyl bromide in the stream would cause severe corrosion problems with the carbon steel boilers making them an unacceptable control option. Also the large volume of essentially inert gas (a heating value of less than 5 Btu/scf) would require a large volume of supplemental fuel and air to treat the stream which the boilers would be unable to handle.

The thermal options (TO, RTO, RCO, CTO and flare) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. The recovery options (absorber/scrubber, carbon adsorber and condenser) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. The addition of an absorber/wet scrubber to the outlet of the HPA while being feasible will have much lower removal efficiency than a normal scrubber since the stream is already being treated in a two-stage absorber system that has already removed most of the pollutants.

The bio-filtration control option would be feasible since it is used for the control of VOCs in other situations. However, it would have a much lower control efficiency for this process due to the presence of a large amount of methyl bromide which is used as a biocide and many VOC compounds that are not water soluble which will lower their destruction efficiency. The presence of halogens and other materials that would acidify the water upon degradation makes a trickling bio-filter a better bio-filter option to treat this stream based on comments on the last page in the USEPA document *USING BIOREACTORS TO CONTROL AIR POLLUTION* EPA-456/R-03-003.

A detailed economic analysis of the technically feasible options has been performed and is summarized in the following subsections.

4.3.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	99
RTO	99
RCO	99
CTO (Existing HPVGTS)	98
Carbon Adsorption/TO	96
Refrigerated Condenser	60
Scrubber/Absorber	50
Bio-filtration	35

4.3.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the options was reviewed with respect to the impacts to determine if they meet BACT requirements.

Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets. The bio-filter information was also based on the USEPA* document *USING BIOREACTORS TO CONTROL AIR POLLUTION* EPA-456/R-03-003 and *Handbook of Environment and Waste Management: Air and Water Pollution*, Hung, Shammas, Wang, World Scientific. 2012. The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The #1 OX baseline emissions are estimated at 1,025.0 tpy. This emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. The #1 OX emissions would give the worst-case answer since the equipment cost ratio based on relative flow rates would be about 90 percent but the #2 emission rate is only about 75 percent. Therefore the ACE for the #2 OX case would be higher for a comparable control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-2 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

Table 4-2
HPA VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST ($)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/ton)	INCREASED ENERGY USAGE ($/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	1,014.7	$1,339,482	$29,021,335	$28,600	11,306,341	Yes
RTO	1,014.7	2,482,554	19,211,876	18,935	1,002,328	Yes
RCO	1,014.7	2,133,646	23,432,003	23,100	5,563,302	Yes
CTO (Existing HPVGTS)	1,004.4	0	567,782	519	360,206	Yes
Flare	1004.4	588,479	19,344,753	19,260	2,072,818	Yes
Carbon Adsorption/TO	983.9	2,110,485	5,437,736	5,530	28,257	Yes
Scrubber/Absorber	512.5	1,225,987	1,772,038	3,458	0	Yes
Refrigerated Condenser	615.0	939,640	271,303	441	0	Yes
Bio-filtration	358.8	759,881	17,495,731	48,762	7,578	No

The TO, RTO, and RCO options are not cost effective based on a comparison to recent South Carolina PSD permit application for AGY-Aiken, LLC that indicated that ACE values in the range of $5,760 to $9,031 were deemed not cost effective for control of VOC. The ACE value for the CTO (existing HPVGTS with existing bromine scrubber) is the highest efficiency control option with an economically feasible control cost. Therefore the existing control option meets the criteria for BACT.

The addition of an absorber/wet scrubber to the outlet of the HPA while being feasible will have much lower removal efficiency than a normal scrubber since the stream is already being treated in a two-stage absorber system that has already removed most of the pollutants.

Also any VOC or organics recovered/captured in a recovery option (carbon adsorption, condenser or scrubber) system would not be able to be recycled to the process since the materials would be contaminants for the process and be detrimental to the operation. Therefore, a secondary control device would be necessary to destroy the contaminants released during the carbon regeneration cycle or in the liquid streams from the condenser or absorber.

The carrier gas for the conveying system must not contain over 5 percent oxygen to avoid explosive conditions in silos with the PTA dust. Therefore, any thermal control technology that requires additional air for the control option would have to provide an alternative inert carrier gas (*e.g.*, nitrogen).

Also any control option that does not allow the stream to be used as a carrier gas would require an alternative inert carrier gas (*e.g.*, nitrogen). This would apply to bio-filtration and carbon adsorption that reduces the pressure to atmospheric making it unusable as a carrier gas.

The TO options will require stainless steel since the presence of the methyl bromide will cause corrosion problems for carbon steel. The use of a direct flame oxidizer (TO, RTO or RCO) for a stream containing a halogen compound (methyl bromide) is not recommended because of the formation of highly corrosive acid gases per USEPA technology fact sheets (see Appendix H) in a direct flame incinerator at the high temperatures. They would at least require an upgrade to their metallurgy to stainless steel. The CTO would not be affected by the halogens since it is not a direct flame incinerator and operates at lower temperatures.

Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. The carbon adsorption will require additional fuel to produce the regeneration steam and the natural gas for the combustion device to control the VOC emissions during the regeneration. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating the vent stream with natural gas. The scrubber option generates a large volume of wastewater that that must be treated. Thermal options (TO, RTO, and RCO) will also generate more products of combustion such as GHG, CO, and NO_X that make these control options less environmentally beneficial. The condenser option will create a large volume of liquid waste that will need to be treated prior to discharge. The proposed technically feasible options are not environmentally beneficial and in all cases create byproducts such as wastewater and secondary air emissions.

4.3.5 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the CTO (existing HPVGTS with bromine scrubber) is the highest control efficiency option that is economically feasible. Therefore the CTO (existing HPVGTS with bromine scrubber) control option meets the criteria for BACT. BP proposes a BACT limit for VOC emissions from the #1 HPVGTS of 4.7 lbs/hr based on a 3-hour average and #2 HPVGTS of 3.5 lbs/hr based on a 3-hour average. These process vents are subject to CAM requirements and will be monitored in accordance with the existing CAM plan to demonstrate compliance with the BACT limit. The details of the monitoring are listed in Subsection 2.5 of this application. If performance testing is required the VOC emissions will be determined every 36 months in accordance with either Method 18 or Method 25A.

4.4 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from Crystallizer Vent Scrubbers

The temperature of the PTA crystallizers is controlled by flashing off some of the liquid in the crystallizer. This vapor stream is routed to the PTA Crystallizer Vent Scrubber where the stream is scrubbed with water to remove the entrained PM, which in mostly PTA product. The scrubbing water containing the PM is sent to the PTA feed drum for slurrying the TA feed and to recycle the PTA recovered in the Vent Scrubber.

The scrubbed vapor from the Crystallizer Vent Scrubber, which is about 99 percent steam, is emitted to the atmosphere and contains about 87.6 tpy of VOC in #1 and #2 PTA Crystallizer Vent Scrubbers. The VOC emitted from the vent scrubber is material entrained in the TA feed to the PTA section.

4.4.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type Process Vents (emissions from air OX, distillation, and other reaction vessels), Organic Chemical production. The results of the RBLC search are shown in Appendix C. The search returned nine facilities and 33 processes for BACT in this industrial category. The following control device was identified from the search:

- Absorber/Wet Scrubber
- Condenser
- TO
- RTO
- Flare

No control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAP standards. The results of this review indicated that the following control equipment may be effective in the reduction of VOCs:

- Adsorber
- CTO
- RCO
- Boilers
- Bio-filters

A BACT analysis was performed for each of the control equipment options. The processes currently do not have any add-on controls to the PTA crystallizer emissions.

4.4.2 Elimination of Infeasible Control Options

The control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of VOC:

1. Absorber/Scrubber
2. TO
3. CTO
4. RTO
5. RCO
6. Condenser
7. Bio-filters

The use of a Flare was found to be technically infeasible since the use on a high volume stream that is over 99 percent steam with a heating value of less than 1 Btu/scf is not feasible.

The use of carbon adsorption is not technically feasible because of the high moisture content, over 99 percent, of the stream from the crystallizer scrubber. At moisture contents over 50 percent, water molecules begin to compete with the hydrocarbon for active adsorption sites which significantly lowers the efficiency and capacity of the system.

The use of the existing boilers as a control option is technically infeasible because the large volume of essentially inert gas (a heating value of less than 5 Btu/scf) would require a large volume of supplemental fuel and air to treat the stream which the boilers would be unable to handle.

The thermal options (TO, RTO, RCO, CTO, and flare) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. The recovery options (absorber/scrubber, and condenser) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. The addition of an absorber/wet scrubber to the outlet of the HPA while being feasible will have much lower removal efficiency than a normal scrubber since the stream is already being treated in a two-stage absorber system that has already removed most of the pollutants.

The bio-filtration control option would be feasible since it is used for the control of VOCs in other situations. However, it would have a lower control efficiency for this process due to the presence of VOC compounds that are not water soluble which will lower their destruction efficiency. The large amount of water in the inlet stream will require dehumidification prior to the bio-filter.

A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

4.4.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	99
RTO	99
RCO	99
CTO	98
Existing HPVGTS CTO	98
Flare	98
Scrubber/Condenser	90
Bio-filter	70
Condenser	60

4.4.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets. The bio-filter information was also based on the USEPA* document *USING BIOREACTORS TO CONTROL AIR POLLUTION* EPA-456/R-03-003 and *Handbook of Environment and Waste Management: Air and Water Pollution,* Hung, Shammas, Wang, World Scientific. 2012. The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The baseline emissions are estimated at 87.6 tpy for the #2 PTA crystallizer vent scrubber emissions. The #2 PTA emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. The #2 emission rate would give the worst case answer since the equipment cost ratio based on relative flow rates would be over 100 percent but the #1 emission rate is only about 56 percent. Therefore the ACE for the #2 OX case would be higher for a comparable control option. Table 4-3 provides a summary the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

All the technically feasible will require additional equipment to raise the pressure on the Crystallizer Vent Scrubber outlet, which is almost at atmospheric pressure, to allow it to flow through any of the add-on control devices. The installation of the additional equipment to increase the pressure of the process stream (*i.e.,* fan/blower) to allow it to flow through a control device will in turn increase the capital cost for the proposed configuration. The use of the existing HPVGTS CTO will require a compressor rather than a fan/blower to provide the required pressure to enter the HPVGTS system.

Table 4-3
Crystallizer Scrubber VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST ($)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/ton)	INCREASED ENERGY USAGE ($/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	86.7	732,116	$1,606,826	$18,533	$1,420,194	Yes
RTO	86.7	1,212,766	1,107,759	12,780	840,446	Yes
RCO	86.7	972,441	1,772,897	20,450	1,342,851	Yes
CTO	85.8	1,518,634	1,214,489	14,155	913,344	Yes
Existing HPVGTS CTO	85.8	1,267,385	1,748,926	20,384	1,428,322	Yes
Flare	85.8	910,775	22,817,898	265,940	22,617,850	Yes
Scrubber/Condenser	78.8	1,301,609	717,878	9,110	11,366	Yes
Bio-filter/Condenser	65.7	869,952	495,525	7,542	9,472	No
Condenser	52.6	539,638	438,446	8,335	18,944	Yes

Also any VOC or organics recovered/captured in a recovery option (condenser or scrubber) system would not be able to be recycled to the process since the materials would be contaminants for the process and be detrimental to the operation. Therefore, a secondary control device would be necessary to destroy the contaminants released during the carbon regeneration cycle or in the liquid streams from the condenser or absorber.

The use of a bio-filter will require a dehumidification device since the stream is 99 percent steam and the water would over whelm the bio-filter system. The large volume of water removed by the condenser will have to be treated in the wastewater system.

All the feasible control options are not cost effective based on a comparison to the recent South Carolina PSD permit application for AGY-Aiken, LLC that indicated that ACE values in the range of $5,760 to $9,031 were deemed not effective for control of VOC. Since the ACE value for the options are all above this value per ton of VOC removed, these are not economically feasible.

Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. The remaining options do not appear to have any significant energy savings that have not already been considered as part of the economic analysis.

Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. Each of the control options results in significant increases in energy usage from powering fans with electricity to heating vent streams with natural gas. The scrubber and condenser options will generate large quantities of wastewaters that will need to be treated in the wastewater plant. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as GHG, CO, and NO_x that make these control options less environmentally beneficial. The results of those analyses are combined with this analysis to select the best control option.

4.4.5 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has determined that none of the technically feasible control options is BACT. BACT for this emission source would be no further control. BP proposes a BACT limit for VOC emissions from the #1 PTA Crystallizer Vent Scrubber of 20 lbs/hr based on a 3-hour average and #2 PTA Crystallizer Vent Scrubber of 20 lbs/hr based on a 3-hour average. This limit would be monitored by a specialized performance test, using methodology negotiated with the agency, on this steam stream once every 5 years.

4.5 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from Oxidation Unit Fugitives

The OX Units equipment has fluids that contain VOCs which can have fugitive emissions from valves, flanges, drains, vents, pumps, relief valves and other equipment. The PTA Units do not have VOC-containing process streams.

Presently, the OX units have several LDAR programs to minimize the fugitive emissions. LDAR programs are a method to monitor, detect, and repair fugitive emission leaks from process equipment. The programs define a monitor reading that is considered a leak that needs to be repaired and thereby minimizes fugitive emissions. The present LDAR programs include components subject to NSPS VV, HON and a program similar to NSPS VV. The estimated PTE emissions from the oxidation unit equipment fugitive points after the project with the present LDAR monitoring programs and before considering the impact of BACT is 193.1 tpy of VOC.

4.5.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type Equipment Leaks, Organic Chemical production. The search returned 12 facilities and 23 processes for BACT in this industrial category. The following emission controls were the only ones identified from the search:

- LDAR Program NSPS VV
- LDAR Program HON MACT

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and NSPS and NESHAPs standards. The results of this review did not find any additional control options applicable to this emission source.

A BACT analysis was performed for this option including an upgrade of the present LDAR program.

The NSPS VV LDAR program is based control of fugitive VOC emissions by monitoring equipment containing over a threshold concentration of VOC materials based on the regulations schedule for various components.

The HON MACT LDAR program is based control of fugitive HAP emissions by monitoring equipment containing over a threshold concentration of HAP materials based on the regulations schedule for various components.

4.5.2 Elimination of Infeasible Control Options

The control options were evaluated qualitatively to determine if these options are technically feasible. An upgrade of the existing program for components subject to NSPS VV or a similar program to either an NSPS VVa or a HON LDAR program was determined to be technically feasible. The upgrade to a HON LDAR program would include assuming all VOCs are HAPS for determining component applicability to HON monitoring. The LDAR programs are feasible control options since they are a widely accepted work practice for the chemical industry and are already in practice at the facility.

A detailed economic analysis of the different possible LDAR program upgrades has been performed and is summarized in the following subsections.

4.5.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing USEPA documents. The remaining control options and their associated anticipated effectiveness factors for a couple of different components are shown below as a comparison of relative efficiency:

CONTROL OPTION	LIQUID VALVE EFFECTIVENESS FACTOR (%)	LIGHT LIQUID PUMPS EFFECTIVENESS FACTOR (%)
HON MACT LDAR Program	88	75
NSPS VVa LDAR Program	88	71
LDAR VV Program (existing)	61	69

4.5.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the resulting annual operating and maintenance costs. The operating expenses were based on historical costs for the existing BP CR LDAR program. The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The baseline emissions for the existing LDAR program for both #1 and #2 Units combined are estimated and reported as 193.1 tpy. This emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. Table 4-4 provides a summary of the annualized cost, and the ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

Table 4-4
Fugitives VOC BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/TON)
Upgrade NSPS VV to HON	146.0	$72,600	$497
Upgrade NSPS VV to VVa	46.4	59,640	1,285

Since the ACE value for each of the options is low per ton of VOC removed, these options are both economically feasible.

Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties or benefits exist beyond what was considered in the economic analysis described in the previous section.

Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The control options do not create any adverse environmental impacts.

4.5.5 Selection of Best Available Control Technology

Based on the energy, environmental and economic impacts associated with the technically feasible control options, BP has concluded that upgrading the existing LDAR program by considering all VOCs as HAPs and using the HON LDAR program for the applicable components would be BACT. BP CR will upgrade the LDAR program for the #1 and #2 units. These emissions will be monitored by the HON LDAR requirements and reported per the HON reporting to demonstrate compliance with BACT.

4.6 Best Available Control Technology Analysis for Carbon Monoxide Emissions from Low Pressure Absorbers

The OX Unit LPA is a recovery device for several process streams in the unit. The LPA recovers the acetic acid in the inlet streams and recycles it into the process so it eventually reaches the reactor system. This is a valuable material that acts as the solvent for the process and any loss from the LPA outlet must be replaced by purchase of fresh acetic acid. Part of the optimization of the manufacturing process is to minimize the loss of acetic acid. The CO is produced in the reactor by unwanted side reaction of oxygen with the acetic acid solvent which causes the loss of the valuable acetic acid that must be replaced and the diversion of the oxygen from the desired reaction to produce TA. The LPA does not recover any of the CO which is a contaminant and diluent for the process and would adversely impact the process if recycled to the unit. This analysis will be based on add-on controls to the outlet of the LPA recovery device.

The PTE of CO emissions from the LPA will be about 18.0 tpy for #1 OX LPA and 15.2 tpy for #2 OX LPA. The LPA outlet stream will require a fan to raise the pressure sufficiently to allow the stream to go to a control device.

4.6.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of CO that are used in the process types 64.000, 64.003 and 64.999, SOCMI production. The results of the RBLC search are shown in Appendix C. The search returned seven facilities and nine processes for BACT in these industrial categories. The following control devices were identified from the search:

- CTO
- Good Combustion

In the RBLC, no control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce CO emissions. The results of this review indicated that the following control equipment may be effective in the reduction of CO:

- TO
- RTO
- RCO
- Flare

4.6.2 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of CO:

1. TO
2. RTO
3. RCO
4. CTO

Since the OX LPA is not a combustion process, the good combustion practices control option is not feasible. The Flare is not a feasible option since the emissions factors for CO emissions from a flare in AP-42 (Table 13.5-1) would indicate that more CO would be created from the combustion of all the required supplemental natural gas than would be removed. The thermal options (TO, RTO, RCO, and CTO) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process.

A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

4.6.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	95
CTO	95
Existing HPVGTS CTO	95
RTO	95
RCO	95

4.6.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets.* The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The baseline emissions from #1 OX LPA are estimated at 18.0 tpy. The #1 OX LPA emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. This would be the worst case since the #2 to #1 ratio of the flow rate impact on equipment costs would be about 92 percent and emission rate ratio would only be about 85 percent. As an example ACE calculation, assume the control efficiency of an option is 95 percent. The (baseline emission rate-control option emission rate) for each option is equal to {18.0 tpy – [18.0 tpy X (1-95%)]} or 17.1 tons on an annual basis. This emission rate is used to determine the ACE for the specific control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-5 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

All the technically feasible will require additional equipment to raise the pressure on the LPA outlet, which is almost at atmospheric pressure, to allow it to flow through any of the add-on control devices. The installation of the additional equipment to increase the pressure of the process stream (*i.e.*, fan/blower) to allow it to flow through a control device will in turn increase the capital cost for the proposed configuration.

Since the ACE value for the options are all very high per ton of CO removed, these are not economically feasible. The ACE values are compared to Georgia PSD applications for Johns Manville-Winder and Houston American Cement which indicated that ACE values of $5,800-9,696 were not cost effective for CO control.

Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

Table 4-5
LPA CO BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST ($)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/ton)	INCREASED ENERGY USAGE ($/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	17.1	$797,659	$535,524	$31,317	$329,068	Yes
CTO	17.1	1,151,592	375,828	21,978	132,869	Yes
Existing HPVGTS CTO	17.1	830,431	1,062,446	62,131	1,428,322	Yes
RTO	17.1	1,289,233	464,581	27,168	188,922	Yes
RCO	17.1	1,551,405	500,627	29,276	97,422	Yes

Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating the vent stream with natural gas. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as CO and NO_X that make these control options less environmentally beneficial. The proposed technically feasible options are not environmentally beneficial and in some cases create byproducts such as secondary air emissions.

4.6.5 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the add-on control equipment options are not economically or environmentally feasible. The proposed BACT for CO emissions from the LPA is no further control. BP proposes a BACT limit for CO emissions from the #1 OX LPA of 4.1 lbs/hr and #2 OX LPA of 3.5 lbs/hr based on a 3-hour average. The LPA provides control for VOC emissions and monitoring has been proposed in Subsection 4.2. No parameter monitoring will be proposed for LPA CO emissions. The LPA only controls VOC and HAPs emissions. Monitoring for VOC has been proposed in Subsection 4.2 as the existing CAM plans. It has no impact on CO emissions since it does not control CO. The monitoring for CO emissions will be based on performance testing of the LPA CO emissions every 36 months in accordance with Method 10B.

4.7 Best Available Control Technology Analysis for Carbon Monoxide Emissions from High Pressure Absorbers

The OX reactor temperature is controlled by boiling off some of the liquid in the reactor. This vapor stream goes through several stages of condensing, with the condensed liquid being returned to the reactor, before the reactor overhead is sent to the recovery system. This recovery system consists of an acetic acid scrubber and then the HPA. This analysis will be based on the outlet of the HPA recovery device.

Presently the outlet of the HPA is sent to the HPVGTS where the pollutants (VOC, CO, and HAPs) are controlled in a catalytic oxidation reactor and a bromine scrubber before the stream is exhausted to either the inert gas system for use as a carrier gas for the conveying system or the expander for power recovery prior to being exhausted to the atmosphere. Any control option must include a bromine scrubber to comply with the Montreal Protocol agreement on methyl bromide emissions. The carrier gas for the conveying system must not contain over about 5 percent oxygen to avoid explosive conditions in silos with the PTA dust. Therefore, any thermal control system that requires additional air for the control option would have to provide an alternative inert carrier gas (*i.e.*, nitrogen).

The PTE CO emissions from the HPA will be 7,700 tpy for #1 OX HPA and 6,572 tpy for #2 OX HPA.

4.7.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of CO that are used in the process types 64.000, 64.003, and 64.999, SOCMI production. The results of the RBLC search are shown in Appendix C. The search returned seven facilities and nine processes for BACT in these industrial categories. The following control devices were identified from the search:

- CTO
- Good Combustion

In the RBLC no control devices were found to apply directly to the PTA manufacturing process. The processes currently utilize a CTO as the add-on control device.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*,

EPA/452/B-02-001, January 2002; and the applicable NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce CO emissions. The results of this review indicated that the following control equipment may be effective in the reduction of CO:

- TO
- RTO
- RCO
- Flare

A BACT analysis was performed for each of the control equipment options. The processes currently utilize catalytic oxidation units and continued utilization of the existing abatement devices was determined to meet BACT for the processes. The other options were determined to be technically infeasible and/or economically infeasible to the control option selected.

4.7.2 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible:

1. TO
2. RTO
3. RCO
4. CTO (existing HPVGTS)

Since the HPA is not a combustion process the good combustion practices control option is not feasible. The Flare is not a feasible option since the emissions factors for CO emissions from a flare in AP-42 (Table 13.5-1) would indicate that more CO would be created from the combustion of all the required supplemental natural gas than would be removed. The thermal options (TO, RTO, RCO, and CTO) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

4.7.3 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	95
RTO	95
RCO	95
CTO (Existing HPVGTS)	95

4.7.4 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets.* The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The #1 OX HPA baseline emissions are estimated at 7,700 tpy. This emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. The #1 OX emissions would give the worst case answer since the equipment cost ratio based on relative flow rates would be about 90 percent but the #2 emission rate is only about 85 percent. Therefore the ACE for the #2 OX case would be higher for a comparable control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-6 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

The emission reduction in the above table includes the destruction of the CO in the inlet stream and the additional CO generated by the combustion of fuel. The ACE value for all the control options would be economically feasible per ton of pollutants removed but the CTO (existing HPVGTS) has the largest overall CO destruction and the lowest ACE. Also as shown previously for the VOC control, the CTO (existing HPVGTS) control option was the choice for BACT.

Table 4-6
HPA CO BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST ($)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/ton)	INCREASED ENERGY USAGE ($/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	7,160.6	$1,339,482	$29,021,335	$4,060	11,306,341	Yes
RTO	7,288.6	2,482,554	19,211,976	2,636	1,362,534	Yes
RCO	7,231.6	2,133,646	23,400,467	3,236	5,923,508	Yes
CTO (Existing HPVGTS)	7,297.6	0	567,782	78	360,205	Yes

Hence looking at the emission reduction, ACE, and VOC BACT choice, the CTO (existing HPVGTS with bromine scrubber) would be BACT for CO.

Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating vent streams with natural gas. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as GHG, CO, and NO_X that make these control options less environmentally beneficial. The CTO will have a greater CO reduction than the other options since it doesn't generate CO emissions due to burning supplemental fuels. The proposed technically feasible options are not environmentally beneficial and in some cases create byproducts such as secondary air emissions.

4.7.5 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the CTO (existing HPVGTS with bromine scrubber) is the highest control efficiency option with the lowest cost per ton of control. Therefore the CTO (existing HPVGTS with bromine scrubber) control option meets the criteria for BACT. BP proposes a BACT limit for CO emissions from the #1 OX HPA of 87.9 lbs/hr and #2 OX HPA of 75.1 lbs/hr) based on a 30-day average. This process vent will be subject to the requirements for a CAM plan and will be monitored in accordance with the existing CAM plan. The details of the monitoring are listed in Subsection 2.5 of this application. If performance testing of the HPVGTS CO emissions is required, the CO will be determined every 36 months in accordance with Method 10B.

4.8 Best Available Control Technology Analysis for Carbon Monoxide Emissions from PTA Crystallizer Vent Scrubber

The temperature of the PTA crystallizers is controlled by flashing off some of the liquid in the crystallizer. This vapor stream is routed to the PTA Crystallizer Vent Scrubber where the stream is scrubbed with water to remove the entrained PM, which in mostly PTA product. The scrubbing water containing the PM is sent to the PTA feed drum for slurrying the TA feed and to recycle the PTA recovered in the Vent Scrubber.

The scrubbed vapor from the Crystallizer Vent Scrubber, which is about 99 percent steam, is emitted to the atmosphere and contains about 28.5 tpy of CO in #1 and #2 PTA Crystallizer Vent Scrubbers.

4.8.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of CO that are used in the process types 64.000, 64.003, and 64.999, SOCMI production. The results of the RBLC search are shown in Appendix C. The search returned seven facilities and nine processes for BACT in these industrial categories. The following control devices were identified from the search:

- CTO
- Good Combustion

In the RBLC, no control devices were found to apply directly to the PTA manufacturing process.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce CO emissions. The results of this review indicated that the following control equipment may be effective in the reduction of CO:

- TO
- RTO
- RCO
- Flare

4.8.1 Elimination of Infeasible Control Options

Seven control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of CO:

- TO
- RTO

– RCO

– CTO

Since the PTA Crystallizer Vent Scrubber is not a combustion process, the good combustion practices control option is not feasible. The Flare is not a feasible option since the emissions factors for CO emissions from a flare in AP-42 (Table 13.5-1) would indicate that more CO would be created from the combustion of all the required supplemental natural gas than would be removed. The thermal options (TO, RTO, RCO, and CTO) are all feasible since they have been used on similar processes successfully and there is no technical reason they would not work on this process. A detailed economic analysis of the remaining technically feasible options has been performed and is summarized in the following subsections.

4.8.2 Ranking of Remaining Control Technologies

The potential effectiveness of the remaining control options has been evaluated by reviewing manufacturer information and USEPA documents. The remaining control options and their associated anticipated efficiencies are listed below:

CONTROL OPTION	EFFICIENCY (%)
TO	95
CTO	95
Existing HPVGTS CTO	95
RTO	95
RCO	95

4.8.2 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

4.8.2.1. Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE was determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. The capital and operating expenses were obtained from using the *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001 or *EPA's Air Pollution Control Fact Sheets.* The ACE is estimated according to the following formula:

ACE = (Control Option Annualized Cost)/(Baseline emission rate - Control option emission rate)

The baseline emissions from #1 PTA Crystallizer Vent Scrubber are estimated at 105.2 tpy. The #1 PTA Crystallizer Vent Scrubber emission rate was used as the baseline emission rate for the BACT analysis. This emission rate is used to determine the ACE for the specific control option. As an example ACE calculation, assume the control efficiency of an option is 95 percent. The (baseline emission rate-control option emission rate) for each option is equal to (105.2 tpy – [105.2 tpy X (1-95%)]) or 99.8 tons on an annual basis. This emission rate is used to determine the ACE for the specific control option.

The ACE can be estimated from the above capital and annual operating costs by annualizing the capital cost (multiplying by a factor of 0.10 to simulate a 20-year equipment life and an 8 percent interest rate). This value is added to the annual operating cost and the sum is divided by the product of the control efficiency and the uncontrolled emission rate. Table 4-7 provides a summary of the annualized cost and ACE values for each of the control options. The cost analysis information is provided in Appendix D, BACT Analysis Cost Information.

All the technically feasible will require additional equipment to raise the pressure on the Crystallizer Vent Scrubber outlet, which is almost at atmospheric pressure, to allow it to flow through any of the add-on control devices. The installation of the additional equipment to increase the pressure of the process stream (*i.e.,* fan/blower) to allow it to flow through a control device will in turn increase the capital cost for the proposed configuration.

Since the ACE value for the options are all very high per ton of CO removed, these are not economically feasible. The ACE values are compared to Georgia PSD applications for Johns Manville-Winder and Houston American Cement which indicated that ACE values of $5,800-9,696 were not cost effective for CO control.

Table 4-7
Crystallizer Vent Scrubber CO BACT Analysis

CONTROL OPTION	EMISSION REDUCTION (tpy)	TOTAL CAPITAL COST ($)	ANNUALIZED OPERATING COST ($)	AVERAGE COST EFFECTIVENESS ($/ton)	INCREASED ENERGY USAGE ($/yr)	ADVERSE ENVIRONMENTAL IMPACTS?
TO	99.8	$732,116	$1,594,999	$15,982	$1,413,184	Yes
CTO	99.8	1,518,634	1,214,489	12,169	913,344	Yes
Existing HPVGTS CTO	99.8	1,267,385	1,748,926	17,524	1,428,322	Yes
RTO	99.8	1,212,766	1,107,759	11,100	840,446	Yes
RCO	99.8	972,441	1,722,897	17,263	1,342,851	Yes

4.8.2.2 Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that no unusual energy penalties exist beyond what was considered in the economic analysis described in the previous section. Each of the combustion options will require a substantial amount of increased fuel gas consumption. An analysis of energy benefits was also considered; the various options do not result in any energy benefit for the BP facility.

4.8.2.3 Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The TO, RTO, and RCO control options results in significant increases in energy usage from powering fans with electricity to heating the vent stream with natural gas. Thermal options (TO, RTO, and RCO) will also generate significant quantities of products of combustion such as CO and NO_X that make these control options less environmentally beneficial. The proposed technically feasible options are not environmentally beneficial and in some cases create byproducts such as secondary air emissions.

4.8.3 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the add-on control equipment options are not economically or environmentally feasible. The proposed BACT for CO emissions from the Crystallizer Vent Scrubber is no further control. BP proposes a BACT limit for CO emissions from the #1 PTA of 24 lbs/hr and #2 PTA Crystallizer Vent Scrubber of 20 lbs/hr each on a 30-day average. This limit would be monitored by a specialized performance test, using methodology negotiated with the agency, on this steam stream once every 5 years.

4.9 Best Available Control Technology Analysis for Volatile Organic Compound Emissions from #2 Ox Unit HPVGTS Fired Heater

The fired heater in the #2 OX Unit HPVGTS preheats the feed to the HPVGTS reactor through indirect heat exchange. The emissions from the combustion of the natural gas fuel are exhausted out the heater stack. The heater is a nominal 15 MMBtu/hr heater with a single burner that in its actual operation averages less than 3 MMBtu/hr for the year. This fired heater is subject to 40 CFR 60 Subpart DDDDD and will be required to meet the tune-up requirements of the regulation.

4.9.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of VOC that are used in the process type 13.31 (Natural Gas-Fired Boilers/Furnaces <100 MMBtu/hr). The results of the RBLC search are shown in Appendix C. The search returned 65 facilities and 93 processes for BACT in this industrial category. The following control devices were identified from the search:

- Good Combustion
- Natural Gas Fuel
- Flue Gas Recirculation (FGR)
- Tune-ups

In the RBLC, most of the BACT controls were either no controls or good combustion/natural gas fuel. The heater currently utilizes natural gas as the only permitted fuel and good combustion practices. This fired heater is subject to 40 CFR 60 Subpart DDDDD and will be required to meet the tunes-up requirements of the regulation.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and applicable NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce VOC emissions.

4.9.2 Elimination of Infeasible Control Options

The four identified control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of VOC:

- Good Combustion
- Natural Gas Fuel
- Tune-ups

The FGR is not a feasible option since the existing heater is not compatible with a FGR system and would need to build a new heater to accommodate FGR. All the other listed control options are feasible since they are already in practice for the heater.

4.9.3 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

4.9.3.1 Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE is normally determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. However, since the use of natural gas, tune-ups, and other good combustion practices are already in place or mandated by regulation there is no new capital cost or operating cost associated with them. Hence, the ACE for each of these control options would be zero and they are all economical.

4.9.3.2 Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that they have no unusual energy penalties. An analysis of energy benefits was also considered; the tune-up and good combustion options result in an energy benefit for the BP facility due to improved efficiency.

4.9.3.3 Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The proposed technically feasible options would have some environmental benefit due to a reduction in energy usage.

4.9.4 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the present control options of good combustion, natural gas fuel and tune-ups utilized for the heater are BACT and no further controls are justified. The good combustion practices would include the tune-ups and maintaining the heater and burner in accordance with the maintenance plan developed taking into account good practices and manufacturer recommendations. BP proposes a BACT limit for VOC emissions from the #2 OX HPVGTS Fired Heater of 0. 0055 lb/MMBtu based on a 3-hour averaging time. This limit would be monitored by a following the heater maintenance plan and performing tune-ups in accordance with the requirements of 40 CFR 63 Subpart DDDDD.

4.10 Best Available Control Technology Analysis for Carbon Monoxide Emissions from #2 Ox Unit HPVGTS Fired Heater

The fired heater in the #2 OX Unit HPVGTS preheats the feed to the HPVGTS reactor thru indirect heat exchange. The emissions from the combustion of the natural gas fuel are exhausted out the heater stack. The heater is a nominal 15 MMBtu/hr heater with a single burner that in its actual operation averages less than 3 MMBtu/hr for the year. This fired heater is subject to 40 CFR 60 Subpart DDDDD and will be required to meet the tunes-up requirements of the regulation.

4.10.1 Identification of Control Technologies

The RBLC database was queried for emission sources and control devices of CO that are used in the process type 13.31 (Natural Gas Fired Boilers/Furnaces <100 MMBtu/hr). The results of the RBLC search are shown in Appendix C. The search returned 59 facilities and 92 processes for BACT in this industrial category. The following control devices were identified from the search:

- Good Combustion
- Flue Gas Recirculation (FGR)
- Natural Gas Fuel
- Tune-ups

In the RBLC, most of the processes BACT controls were either no controls or good combustion/natural gas fuel. The heater currently utilizes natural gas as the only permitted fuel and good combustion practices. This fired heater is subject to 40 CFR 60 Subpart DDDDD and will be required to meet the tunes-up requirements of the regulation.

Other resources of control technology were reviewed, such as *EPA Air Pollution Control Technology Fact Sheets*; *EPA Air Pollution Control Cost Manual Sixth Edition*, EPA/452/B-02-001, January 2002; and applicable NSPS and NESHAPs standards. The review indicated that control equipment is typically not employed to reduce CO emissions.

4.10.2 Elimination of Infeasible Control Options

The four identified control options were evaluated qualitatively to determine if these options are technically feasible. The following control technologies were determined to be technically feasible for control of CO:

- Good Combustion
- Natural Gas Fuel
- Tune-ups

The FGR is not a feasible option since the existing heater is not compatible with a FGR system and would need to build a new heater to accommodate FGR. All the other listed control options are feasible since they are already in practice for the heater.

4.10.3 Evaluation of Most Effective Control Technologies and Selection of Best Available Control Technology

The BACT analysis is a three-part investigation that includes economic, energy, and environmental impacts. Each of the remaining options was reviewed with respect to the impacts to determine if they meet BACT requirements.

4.10.3.1 Economic Analysis

The economic analysis is composed of a calculation of the control technologies' ACE based on a comparison of the cost of each feasible control technology in terms of cost per mass of pollutant removed. In general, technologies with excessive costs per ton of pollutant removed are considered excessive in most cases and the installation of that technology would not be deemed economically feasible.

The ACE is normally determined by estimating the capital cost for an installed system and the resulting annual operating and maintenance costs. However, since the use of natural gas, tune-ups, and other good combustion practices are already in place or mandated by regulation there is no new capital cost or operating cost associated with them. Hence, the ACE for each of these control options would be zero and they are all economical.

4.10.3.2 Energy Analysis

An energy impact analysis is used to identify if the technically feasible control options result in any significant or unusual energy penalties or benefits. The feasible control options have been evaluated and it has been determined that they have no unusual energy penalties. An analysis of energy benefits was also considered; the tune-up and good combustion options result in an energy benefit for the BP facility due to improved efficiency.

4.10.3.3 Environmental Analysis

A review of the control options with respect to the environment was conducted to determine if any of the options created any adverse environmental impacts. The proposed technically feasible options would have some environmental benefit due to a reduction in energy usage.

4.10.4 Selection of Best Available Control Technology

Based on the energy, environmental, and economic impacts associated with the technically feasible control options, BP has concluded that the present control options utilized for the heater of good combustion, natural gas fuel and tune-ups are BACT and no further controls are justified. The good combustion practices would include the tune-ups and maintaining the heater and burner in accordance with the maintenance plan developed taking into account good practices and manufacturer recommendations. BP proposes a BACT limit for CO emissions from the #2 OX HPVGTS Fired Heater of 0.084 lb/MMBtu based on a 3-hour averaging time. This limit would be monitored by a following the heater maintenance plan and performing tune-ups in accordance with the requirements of 40 CFR 63 Subpart DDDDD.

4.11 Best Available Control Technology Analysis for Volatile Organic Compound and Carbon Monoxide Emissions from Emergency Generators

The BM-1201 Emergency Generator replacement and the new BM-1204 Emergency Generator at the #1 OX Unit will be diesel fired. These emergency generators will be subject to 40 CFR 60, Subpart IIII Standards of Performance for Stationary Compression Ignition Internal Combustion Engines and will be required to meet Tier 3 emissions standards. Non-emergency operation will be limited to no more than 100 hours per year. The regulatory limit on non-emergency operating time of 100 hours per year and the Tier 3 emission standards limit the emissions of both pollutants to insignificant levels. The potential to emit based on 100 hours per year for CO emissions will be 0.03 tpy each and VOC emissions will be 0.003 tpy VOC for BM-1201 and 0.001 for BM-1204. Since the VOC and CO emissions from these sources will be limited by the size of the generator and an operating restriction of no more than 100 hours per year for maintenance, a full BACT analysis was not performed for the emergency generators. BACT for this emission source would be no further control. BP proposes a BACT limit for VOC and CO emissions of 100 hours per year for non-emergency operation.

Section 5
Air Quality Analysis

5.1 Background

This project triggers PSD permitting requirements for CO and VOCs only. The project does not involve any new sources of CO but a re-distribution of emissions from one source to another. Modeling is only required for CO emissions. No air quality model exists that can evaluate the air quality impact of a point source of VOC emissions on area-wide ozone concentrations. The changes will allow the facility to operate in a more efficient manner. Because PSD permitting requirements have been triggered, air quality analyses are necessary for the proposed changes.

The project is located at the BP-Cooper River facility (see Figure 5-1). Figures 5-2 and 5-3 provide a representation of the facility's boundary and project source locations.

5.2 Modeling Protocol

A modeling protocol was submitted to SC DHEC for review on January 8, 2013. The following section summarizes the approach to the air quality modeling analysis. The air modeling information is included in Appendix G.

5.2.1 Model Selection

Air dispersion modeling was performed using the American Meteorological Society/ Environmental Protection Agency Regulatory Model AERMOD (AERMOD), Version 12345. AERMOD is the preferred model for areas within 50 Km of the source. AERMOD also includes the Plume Rise Model Enhancements (PRIME) algorithms for building downwash.

5.2.2 Information on Urban/Rural Characteristics

The site is located north of the City of Charleston in a predominantly rural area. The AERMOD model was utilized in its non-urban configuration.

5.2.3 Surrounding Terrain

The area surrounding the facility has only minor terrain relief. However following standard AERMOD guidelines, terrain elevations for grid receptors were included in the AERMOD modeling through use of the AERMAP terrain processor and applicable National Elevation Data (NED) files. NED files with NAD83 coordinates were used.

5.2.4 Good Engineering Practice Stack Heights and Building Downwash

No stack in the modeling analysis for this project meets the definition of formula GEP stack height so the BPIP PRIME computer algorithm was used to determine wind directionally dependent building dimensions for use in the AERMOD analysis. A BPIP input file for the facility is included in the modeling files submitted with this application.

5.2.5 Cavity Analysis

Cavities are eddies or areas of nearly stagnant air created on the leeward side of a building. The BP CR facility has the potential to produce cavity impacts. The AERMOD model, with building input data prepared using BPIPPRM algorithm, was used to directly evaluate cavity concentrations.

5.2.6 Meteorological Data

The meteorological data set used in this analysis is from the SC DHEC Website (files CHS-chs_0206_.SFC and CHS-chs_0206_.pfl). These data are from the Charleston meteorological station. Specifically for this project, SC DHEC has updated the meteorological data set with the use of the AERMET Version 12345 processer.

An assessment was made of the applicability of these meteorological data to a modeling analysis at BP CR. The BP CR site is located less than 10 miles from the Charleston airport (the meteorological observation station). The airport site and the BP CR site are both located about 15 miles from the Atlantic coast. There is only minor terrain relief in this part of South Carolina. The AERSURFACE algorithm was used to assess three basic parameters, albedo, Bowman Ratio, and roughness length on an annual basis for 12 wind sectors (results shown in Tables 5-1 and 5-2). The results in Tables 5-1 and 5-2 show that while there is some degree of similarity for albedo there are differences with Bowen Ratio and surface roughness values between the sites. These differences are typical however for comparing the surface characteristics an observation site at an airport with a site not at an airport. Given the relatively small predicted impacts in comparison to the significant impact levels and considering the proximity of the airport site to the project site, this meteorological data set is considered to be a reasonable choice for this analysis.

Table 5-1
Charleston Meteorological Site AURSURFACE Parameters

```
** Generated by AERSURFACE, dated 13016
** Generated from "southcarolina.bin"
** Center UTM Easting (meters):    589718.0
** Center UTM Northing (meters):  3640551.0
** UTM Zone:  17    Datum: NAD83
** Study radius (km) for surface roughness:   1.0
** Airport? Y, Continuous snow cover? N
** Surface moisture? Average, Arid region? N
** Month/Season assignments? User-specified
** Late autumn after frost and harvest, or winter with no snow: 1,2
** Winter with continuous snow on the ground: 0
** Transitional spring (partial green coverage, short annuals): 3,4
** Midsummer with lush vegetation: 5,6,7,8,9
** Autumn with unharvested cropland: 10,11,12

   FREQ_SECT  ANNUAL 12
   SECTOR   1    0   30
   SECTOR   2   30   60
   SECTOR   3   60   90
   SECTOR   4   90  120
   SECTOR   5  120  150
   SECTOR   6  150  180
   SECTOR   7  180  210
   SECTOR   8  210  240
   SECTOR   9  240  270
   SECTOR  10  270  300
   SECTOR  11  300  330
   SECTOR  12  330  360
**                   Sect    Alb      Bo        Zo
   SITE_CHAR    1       1    0.16     0.70     0.039
   SITE_CHAR    1       2    0.16     0.70     0.050
   SITE_CHAR    1       3    0.16     0.70     0.054
   SITE_CHAR    1       4    0.16     0.70     0.037
   SITE_CHAR    1       5    0.16     0.70     0.029
   SITE_CHAR    1       6    0.16     0.70     0.023
   SITE_CHAR    1       7    0.16     0.70     0.023
   SITE_CHAR    1       8    0.16     0.70     0.038
   SITE_CHAR    1       9    0.16     0.70     0.039
   SITE_CHAR    1      10    0.16     0.70     0.042
   SITE_CHAR    1      11    0.16     0.70     0.028
   SITE_CHAR    1      12    0.16     0.70     0.022
```

Table 5-2
BP Cooper River Site AURSURFACE Parameters

```
** Generated by AERSURFACE, dated 13016
** Generated from "southcarolina.bin"
** Center UTM Easting (meters):    604442.0
** Center UTM Northing (meters):  3648960.0
** UTM Zone:  17    Datum: NAD83
** Study radius (km) for surface roughness:   1.0
** Airport? N, Continuous snow cover? N
** Surface moisture? Average, Arid region? N
** Month/Season assignments? User-specified
** Late autumn after frost and harvest, or winter with no snow: 1,2
** Winter with continuous snow on the ground: 0
** Transitional spring (partial green coverage, short annuals): 3,4
** Midsummer with lush vegetation: 5,6,7,8,9
** Autumn with unharvested cropland: 10,11,12

   FREQ_SECT  ANNUAL 12
   SECTOR   1    0   30
   SECTOR   2   30   60
   SECTOR   3   60   90
   SECTOR   4   90  120
   SECTOR   5  120  150
   SECTOR   6  150  180
   SECTOR   7  180  210
   SECTOR   8  210  240
   SECTOR   9  240  270
   SECTOR  10  270  300
   SECTOR  11  300  330
   SECTOR  12  330  360
**                 Sect    Alb      Bo        Zo
   SITE_CHAR    1      1     0.14     0.33     0.787
   SITE_CHAR    1      2     0.14     0.33     0.777
   SITE_CHAR    1      3     0.14     0.33     0.839
   SITE_CHAR    1      4     0.14     0.33     0.855
   SITE_CHAR    1      5     0.14     0.33     0.791
   SITE_CHAR    1      6     0.14     0.33     0.420
   SITE_CHAR    1      7     0.14     0.33     0.476
   SITE_CHAR    1      8     0.14     0.33     0.520
   SITE_CHAR    1      9     0.14     0.33     0.351
   SITE_CHAR    1     10     0.14     0.33     0.569
   SITE_CHAR    1     11     0.14     0.33     0.690
...SITE_CHAR    1     12     0.14     0.33     0.753
```

5.2.7 Model Receptors

Receptors were placed along the fence at a spacing of 25 meters to 50 meters out to a distance to define the maximum predicted impacts as being within the interior of the grid. The maximum predicted impacts were on the facility boundary in an area of 25 to 50 meter spacing. Figure 5-4 contains a representation of the receptors used in the analysis.

5.2.8 Visibility Impairment Analysis

This project triggers PSD air quality evaluation requirements for CO and VOCs only. Neither of these pollutants is typically understood to affect visibility so no visibility impairment assessment is needed or was undertaken.

5.2.9 Toxic Air Pollutant Analysis

The facility is not subject to a South Carolina Standard No. 8 modeling evaluation because processes at the facility that emit Standard No. 8 pollutants are subject to MACT requirements which can be substituted to meet Standard No. 8 requirements.

5.3 Class I Area Impact Analysis

The responsible FLMs for the Cape Romain Class I area have been contacted and provided information concerning the proposed BP CR project. The land managers did not have any comments concerning the project.

As indicated earlier, this project triggers PSD requirements only for CO and VOCs only. Project net emission increases of nitrogen dioxide (NO_2), SO_2, and PM (PM_{10} and $PM_{2.5}$) do not exceed PSD significance levels. The tools available for a visibility analysis (such as VISCREEN) do not include inputs for CO and VOC emissions, so it is assumed this project would have minimal impacts on visibility in the Class I area.

5.4 Significance Modeling Results for Carbon Monoxide

Project emissions of CO are summarized in Table 5-3. The basis for these emission estimates are presented in other parts of this application. Figure 5-3 shows the location of the project sources.

It should be noted that while Table 5-3 shows an offset emission source with a negative emission rate for #1 OX DHT Overhead Scrubber (BT-702). This source would have operated at that rate only sporadically. Consequently a separate source group was used that included only the four stacks with the positive emissions rates. These results are shown below. The initial modeling analysis showed the following worst-case impacts.

Table 5-3
Project Emission Sources with Parameters

MODEL ID	DESCRIPTION	X (m)	Y (m)	ELEV. (m)	PROJECT EMISSIONS (g/s)	PROJECT EMISSIONS (lb/hr)	STACK HEIGHT (m)	TEMP. (K)	VEL. (m/s)	DIAM. (m)
BT_702[(1)]	DHT Overhead Scrubber	604491.1	3649074	10.02	-10.96	-87.0	10.67	305	21.3	0.304
BT_603	LPA	604628.1	3649119	8.67	0.517	4.1	21.5	322	3.4	0.762
HPVGTS-1	HPVGTS-1	604666.1	3649104	8.81	11.075	87.9	30.48	350	79.8	0.91
DT_302	LPA	604521.3	3648901	8.75	0.437	3.5	24.4	308	0.98	1.07
HPVGTS-2	HPVGTS-2	604642.3	3648896	8.92	9.45	75.0	41.46	333	29.87	1.3

(1) Source would historically operate at the listed emission rates only occasionally. An analysis was completed with all five sources operating and another with only the four stacks with the positive emission rates.

- 1-hour CO Highest Predicted Impact 143 micrograms per cubic meter (µg/m^3)
- 8- hour CO Highest Predicted Impact 70 µg/m^3

These predicted values are below the PSD significant impact thresholds of 2,000 µg/m^3 (1-hour) and 500 µg/m^3 (8-hours). Therefore, no further modeling analysis of emissions for Standard No. 2 is needed.

5.5 Preconstruction Monitoring Requirements

The worst case predicted concentrations are also below the Preconstruction Monitoring threshold of 575 µg/m^3.

No further analysis is therefore needed for CO for this project.

5.6 Analysis for Volatile Organic Compound Impact

No air quality model exists that can evaluate the air quality impact of a point source of VOC emissions on area-wide ozone concentrations. This project was evaluated using a project related net increase in VOC emissions of 72.6 tpy. The estimated increase in emissions of NO_X is below the PSD significant emission increase threshold.

The area measured values of ozone in the Charleston area for the last 3 years are listed below.

- Bushy Park Monitor # 45015002
  8-hour average 4th high – 0.061 parts per million (ppm), 0.065 ppm, 0.066 ppm (2012, 2011, 2010)
- Cape Romain # 450190046
  8-hour average 4th high – 0.064 ppm, 0.066 ppm, 0.068 ppm (2012, 2011, 2010)

The National Ambient Air Quality Standard (NAAQS) for ozone is 0.075 ppm. The monitored values above show the area to be well in attainment of the 8-hour ozone NAAQS.

The VOC impact was based on the project having a relative small increase in VOC emissions of 72.4 tpy and less than 40 tpy of NO_X emissions. Ozone concentrations in South Carolina have been shown to be limited by the presence of NO_X. This project does not result in a significant increase in NO_X emissions so it would be expected that the project as a whole would have minimal impact on area ozone concentrations.

To better assess the relative nature of the project increase in VOC emissions, average actual VOC emissions for the Charleston County and three other surrounding Counties are presented below.

COUNTY	3-YEAR AVERAGE ACTUAL VOC EMISSIONS (tpy)
Charleston	1,430
Berkeley	1,625
Dorchester	470
Colleton	857
Total for Area	4,382

The project VOC emissions impact was based on an estimated VOC emissions increase of 72.6 tpy from this project. This value represents 1.7 percent of the actual area-wide point source emissions of VOCs. Note that this total does not include mobile sources or emissions from minor sources in the area.

Because project emission level increases for VOCs for this project are relatively small and the project does not have a significant increase in NO_X emissions (recall the area is NO_X limited with respect to the formation of ozone), it is concluded this project would not cause area-wide ozone concentrations to increase significantly.

5.7 Preconstruction Monitoring for Ozone

The project emissions of VOCs do not exceed the monitoring *de minimis* threshold of 100 tpy of VOC emissions. Consequently no preconstruction monitoring of ozone is needed for the project.

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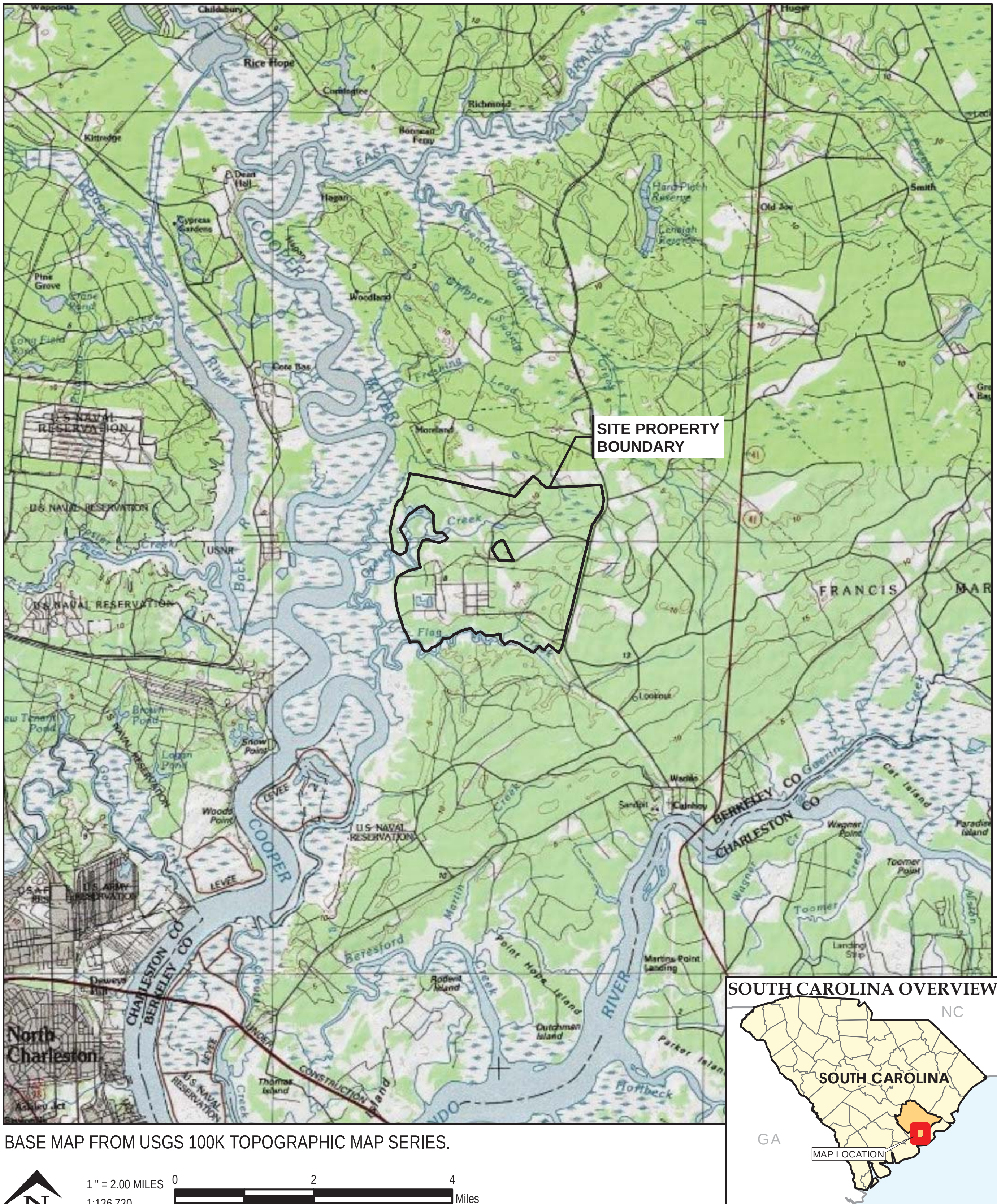
TRC - GIS



BASE MAP FROM USGS 100K TOPOGRAPHIC MAP SERIES.

N

1 " = 2.00 MILES
1:126,720

0 2 4 Miles

TRC

708 Heartland Trail
Suite 3000
Madison, WI 53717
Phone: 608.826.3600

BP COOPER RIVER
SOUTH CAROLINA

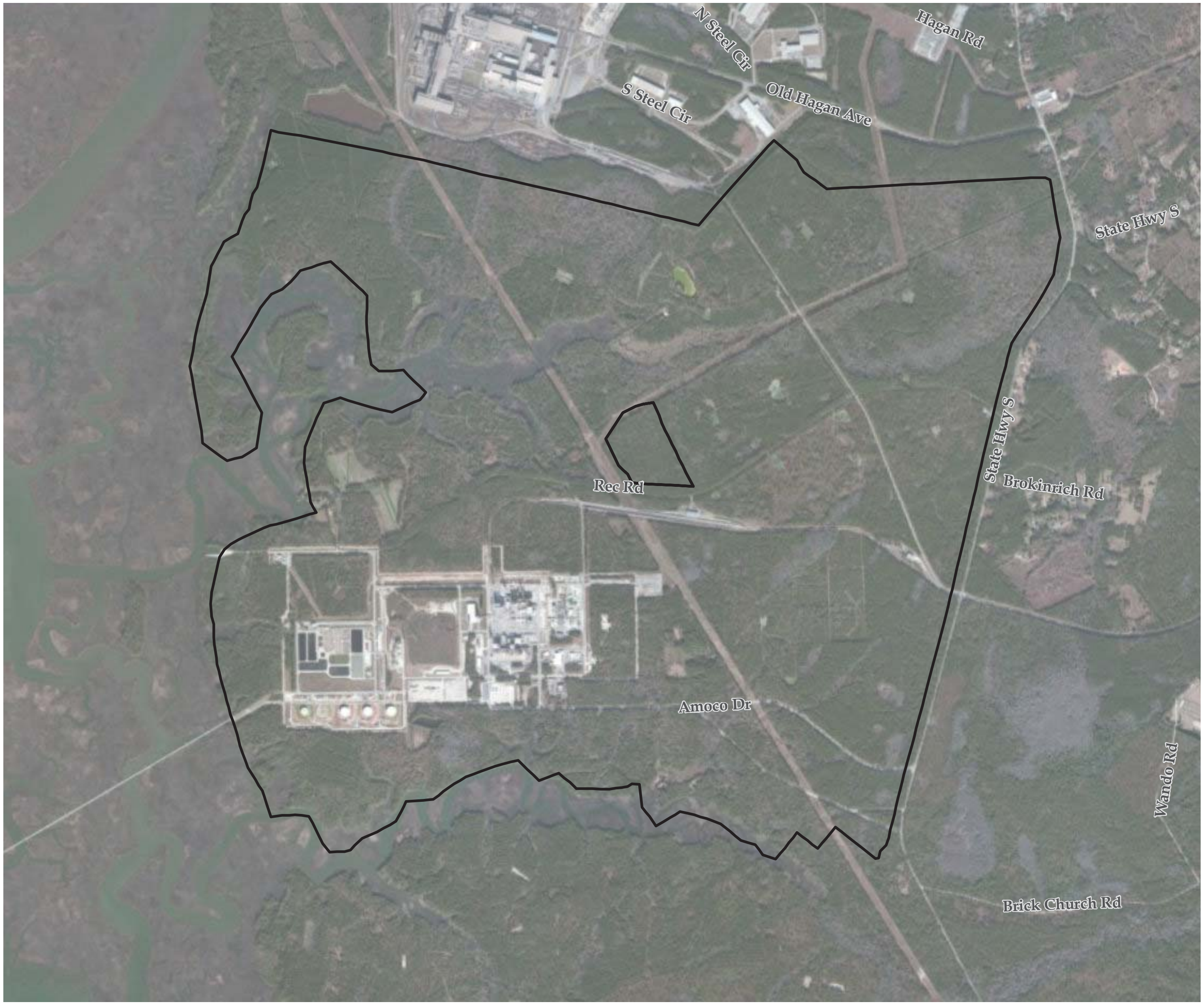
FIGURE 5-1
SITE LOCATION MAP

DRAWN BY:	PAPEZ J
APPROVED BY:	FOX D
PROJECT NO:	187464
FILE NO.	187464-003slm.mxd
DATE:	JANUARY 2013

E:\BP\CooperRiverSC\2012_187464\187464-003slm.mxd

LEGEND

APPROXIMATE FACILITY BOUNDARY



NOTES

1. BASE MAP IMAGERY FROM ESRI WEB SERVICE BASEMAP LAYER, "WORLD IMAGERY".

0 3,000 6,000 FEET

1 INCH = 3,000 FEET

1:36,000

N

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Phone: 608.826.3600
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BP COOPER RIVER
SOUTH CAROLINA

FIGURE 5-2
SITE MAP - FACILITY BOUNDARY

DRAWN BY:	PAPEZ J
APPROVED BY:	FOX D
PROJ. NO.:	187464
FILE NO.:	187464-001.mxd
DATE:	JANUARY 2013

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Saved By: JPAPEZ on 1/8/2013, 08:30:39 AM

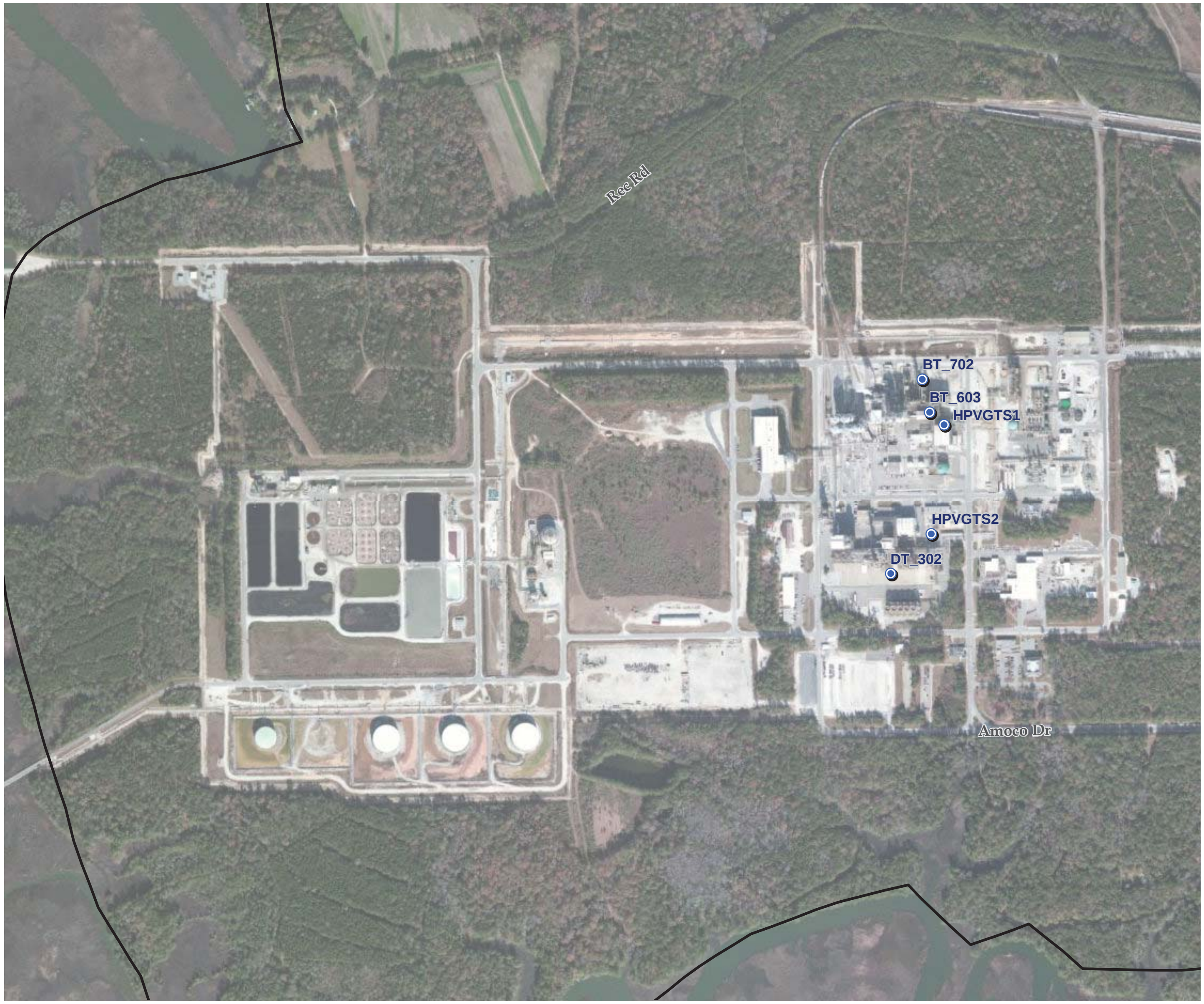
LEGEND

APPROXIMATE FACILITY BOUNDARY

STACK LOCATION

NOTES

1. BASE MAP IMAGERY FROM ESRI WEB SERVICE BASEMAP LAYER, "WORLD IMAGERY".



0 1,000 2,000 FEET

1 INCH = 1,000 FEET

1:12,000

N

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Madison, WI 53717
Phone: 608.826.3600
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BP COOPER RIVER
SOUTH CAROLINA

FIGURE 5-3
PROJECT EMISSION SOURCES

DRAWN BY:	PAPEZ J
APPROVED BY:	FOX D
PROJ. NO.:	187464
FILE NO.:	187464-002.mxd
DATE:	JANUARY 2013

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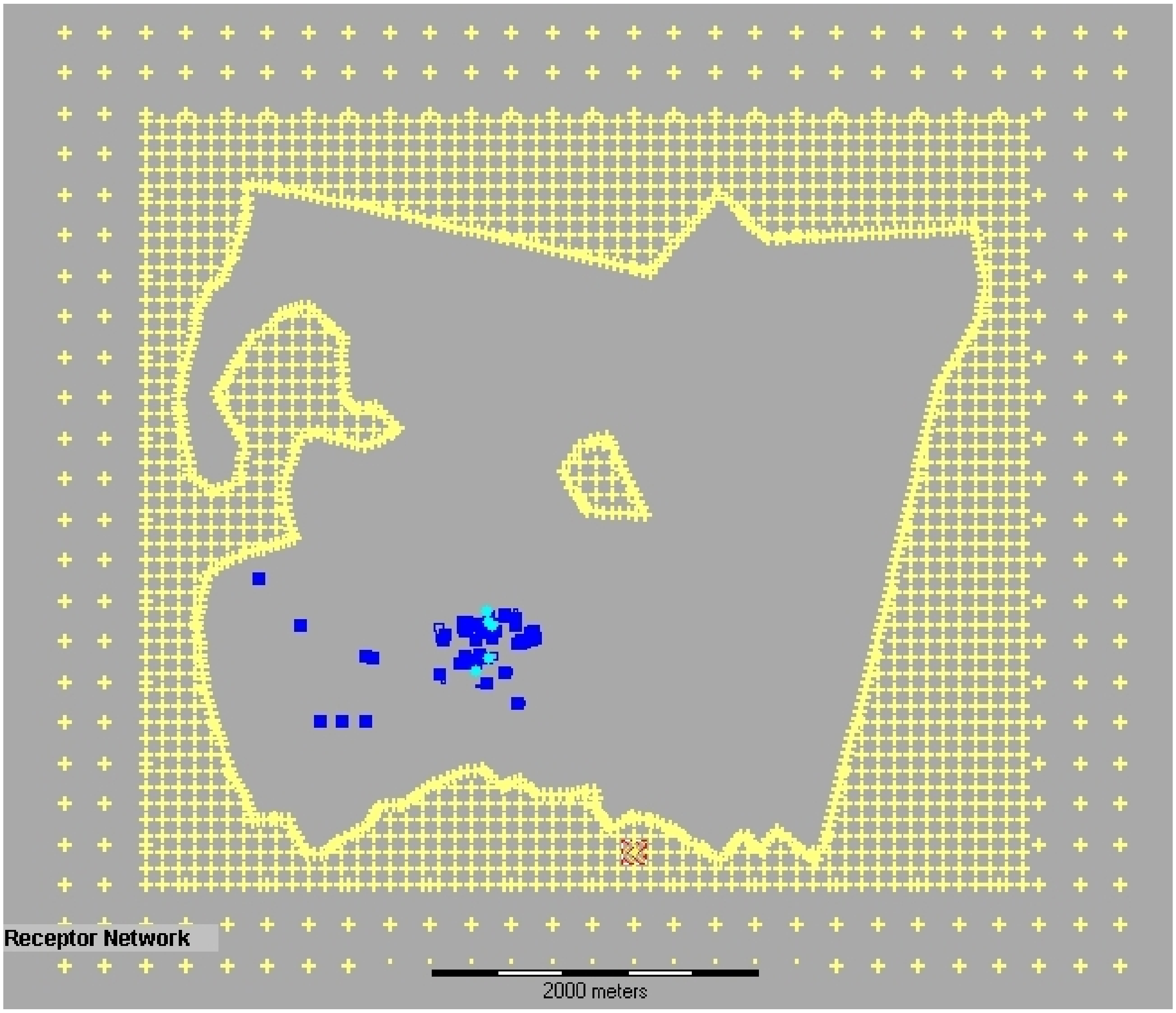
Saved By: JPAPEZ on 1/8/2013, 08:30:26 AM

Figure 5-4
Receptor Network



Section 6
Additional Impacts Analyses

The provisions of South Carolina Regulation 62.5, Standard No. 7 require that additional environmental impact analyses be performed to determine the impairment to visibility, soil, and vegetation that would occur as a result of construction and operation of a major source or a modification to a major source. These regulatory provisions also require that analyses be performed to determine the general commercial, residential, industrial, and other growth associated with operation of a major source or modification, as well as the air quality impact projected for the area as a result of such growth.

6.1 Visibility/Regional Haze

As indicated earlier in this report, the project is projected to have insignificant impact on regional visibility or haze due to the fact that the project triggers PSD requirements only for CO and VOCs. Neither pollutant is a variable that is input in models to determine visibility impacts (such as in the VISCREEN algorithm).

6.2 Associated Growth Impacts

The proposed modification at the BP CR facility is not anticipated to result in any significant increase in full-time employment (an associated increase in traffic flow) at the facility. The construction activity related to the project may allow for a temporary increase in local traffic due to construction related jobs and associated traffic.

6.3 Impacts on Soil and Vegetation

CO at the insignificant predicted levels of concentration for this project do not have any known effects on soils or vegetation. VOC emissions from the project are not projected to have any significant effect on local ozone concentrations. Consequently, no effects on soils or vegetation would be expected from the project.

Section 7
Title V Permit Revisions for PSD Application

The implementation of the requested permit limits will require the revision of some of the permit condition contained in the existing Title V permit. Many of these revisions have been requested in the Title V permit renewal application submitted in January 2012. However, there are some additional Title V permit revisions that will become necessary due to this permit application. The following are some examples of the necessary Title V permit revisions:

- Recognition that the two boilers are gas-fired units rather than oil fired
- Revision of the oil and emissions limits on the boilers
- Revision of 40 CFR 63 Subpart DDDDD and 40 CFR 60 Subpart Db requirements for boilers since gas-fired
- Existing emissions limits for VOC and CO in the OX and PTA units to be replaced with the new BACT emission limits
- Removal of emission points from permit where equipment and emissions are being removed from the process
- Removal of #2 OX requirements for a Group 1 HON process vent since all are now Group 2 vents.

The following existing specific emissions limits in Table 7-1 will be replaced by the BACT limits or revised due to regulatory status changes in the application:

Table 7-1
Emission Limits

UNIT ID	POLLUTANT	LIMIT	UNIT ID	POLLUTANT	LIMIT
03 (#1 HPVGTS)	CO	1,452 lb/hr	03 (BT-702)	VOC	60 lb/hr
03 (#1 HPVGTS)	CO	375 tpy	03 (BT-702)	VOC	165 tpy
03 (#1 HPVGTS)	VOC	85 lb/hr	03-06	VOC	1825 tpy
03 (#1 HPVGTS)	VOC	80 tpy	03-06 (HPVGT)	DRE	95%
03 (#1 LPA)	CO	40 tpy	05-06	VOC	49.3 lb/hr
03 (#1 LPA)	VOC	40 lb/hr	05-06	VOC	215.9 tpy
03 (#1 LPA)	VOC	80 tpy	15-16 Boilers	CO	400 ppm
03 (BT-702)	CO	380 tpy	15-16 Boilers	Oil use	18.675 MM gal

The Title V permit mark-up that was included in the Title V renewal is included in Appendix E. The Title V mark-up has the revisions necessary for this PSD application indicated with yellow highlighting.

Appendix A
SC DHEC Permit Application Forms

DHEC
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Expedited Review Request
Construction Permits

BAQ Use: Recv'd By:

To be eligible for expedited review, the appropriate Construction Permit Application Forms must be included with this sheet.

FACILITY IDENTIFICATION	
Facility Name: BP AMOCO Chemical Company - Cooper River Plant	
Application Date: 4/09/2013	SC Air Permit Number (8-digits only): 0420 - 0029

PRIMARY AIR PERMIT CONTACT			
Title/Position: Environmental Engineer	Salutation: Mr..	First Name: Brent	Last Name: Pace
E-mail Address: Brent.Pace@bp.com		Phone No.: 843.881.5182	Cell No.: 419.303.3987

SECONDARY AIR PERMIT CONTACT (If the Department is unable to contact the primary air permit contact please provided a secondary contact.)			
Title/Position: HSSE Manager	Salutation: Ms..	First Name: Judith	Last Name: Lesslie
E-mail Address: Judith.Lesslie@bp.com		Phone No.: 843-881-5392	Cell No.: 843-870-9134

Check One	Permit Type	Fee*
☐	Minor Source Construction Permit	$3,000
☐	Synthetic Minor Construction Permit	$4,000
☒	Prevention of Significant Deterioration (PSD) not impacting a Class I Area (no Class I modeling required)	$20,000
☐	Prevention of Significant Deterioration (PSD) impacting a Class I Area (Class I modeling required)	$25,000
	General Permit Program	
☐	Minor Source Construction Permit / Relocation Request (Concrete)	$1,500
☐	Minor Source Construction Permit / Relocation Request (Asphalt)	$2,000
☐	Synthetic Minor Source Construction Permit / Relocation Request (Concrete)	$3,000
☐	Synthetic Minor Source Construction Permit / Relocation Request (Asphalt)	$3,500

* **DO NOT** send fee payment with this form. If chosen for expedited review, you will be notified by phone for verbal acceptance into the program. Fees must be paid within five business days of acceptance.

PRIMARY AIR PERMIT CONTACT SIGNATURE
I have read the Expedited Review Program Standard Operating Procedures and accept all of the terms and conditions within. I understand that it is my responsibility to ensure an application of the highest quality is submitted in a timely manner, and to address any requests for additional information by the deadline specified. I understand that submittal of this request form is not a guarantee that expedited review will be granted.

Brent Pace 4-9-13

Signature of Primary Air Permit Contact Date

D H E C
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Facility Information

BAQ Use: CP ID: Recv'd By:

A. FACILITY INFORMATION			
1. SC Air Permit Number (8-digits only): 0420 - 0029		2. Application Date: 4/09/2013- Revised 03/04/2014	
3. Facility Name: BP Amoco Chemical Company - Cooper River Plant		4. Facility Federal Tax Identification No.: SCD084703909	
5. Physical Address: 1306 Amoco Dr.			6. County: Berkeley
7. City: Wando		State: SC	8. Zip Code: 29492
9. Facility Coordinates Facility coordinates should be based at the front door or main entrance of the facility.			
Latitude: 604725.47E	Longitude: 3648659.14N	☒ NAD27 or ☐ NAD83	

B. COMPANY INFORMATION		
1. Company Name: BP Amoco Chemical Company - Cooper River Plant		
2. Mailing Address: 1306 Amoco Dr.		
3. City: Wando	4. State: SC	5. Zip Code: 29492

C. CO-LOCATION DETERMINATION
Are there other facilities in close proximity that could be considered co-located? ☒ No ☐ Yes**
List potential co-located facilities, including air permit numbers if applicable:
If applicable, location in application for co-location determination:

(**If yes, please submit co-location applicability determination details in an attachment to this application.)

D. CONFIDENTIAL INFORMATION / DATA
Does this application contain confidential information or data? ☐ No ☒ Yes***

(***If yes, include a sanitized version of the application for public review.)

E. COMMUNITY OUTREACH
What are the potential air issues and community concern Based on previous modeling and the modeling attached to this application, there are no potential air issues / community concerns from this project

F. FACILITY'S PRODUCTS / SERVICES	
1. Primary Products / Services: Purified Terephthalic Acid (PTA)	
2. Primary SIC Code: 2869	3. Primary NAICS Code: 325199
4. Other Products / Services:	
5. Other SIC Code(s):	6. Other NAICS Code(s):

G. AIR PERMIT CONTACT (Person who can answer questions about the facility and permit application.)			
Title/Position: Environmental Engineer	Salutation: Mr.	First Name: Brent	Last Name: Pace
Mailing Address: 1306 Amoco Dr.			
City: Wando		State: SC	Zip Code: 29492
E-mail Address: Brent.Pace@bp.com		Phone No.: 843.881.5182	Cell No.: 419.303.3987

The signed permit will be mailed to the Air Permit Contact listed above unless otherwise indicated below. Only one hard copy of the permit will be mailed via the postal service. Additional copies can be sent electronically. Please indicate below any additional individuals who should receive a copy of the permit.

Name	E-mail Address
Michael Doerner	mdoerner@trcsolutions.com

DHEC
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Facility Information

H. OWNER OR OPERATOR			
Title/Position: Plant Manager	Salutation: Mr.	First Name: Mark	Last Name: Fitts
Mailing Address: 1306 Amoco Dr.			
City: Wando		State: SC	Zip Code: 29492
E-mail Address: mark.fitts@bp.com		Phone No.: 843.881.5201	Cell No.:
OWNER OR OPERATOR SIGNATURE			
I certify, to the best of my knowledge and belief, that no applicable standards and/or regulations will be contravened or violated. I certify that any application form, report, or compliance certification submitted in this permit application is true, accurate, and complete based on information and belief formed after reasonable inquiry. I understand that any statements and/or descriptions, which are found to be incorrect, may result in the immediate revocation of any permit issued for this application.			

Signature of Owner or Operator　　　　Date

I. AIR PERMIT CONSULTANT (If not the same person as the Professional Engineer.)			
Consulting Firm Name: TRC Environmental Corporation			
Title/Position: Air Quality Specialist	Salutation: Mr.	First Name: Michael	Last Name: Doerner
Mailing Address: 30 Patewood Dr. Suite 300			
City: Greenville		State: SC	Zip Code: 29615
E-mail Address: mdoerner@trcsolutions.com		Phone No.: 864.234.9481	Cell No.: 864.884.2683

J. PROFESSIONAL ENGINEER INFORMATION			
Consulting Firm Name: TRC Environmental Corporation			
Title/Position: Project Manager	Salutation: Mr.	First Name: Robert	Last Name: vandenMeiracker
Mailing Address: 30 Patewood Dr. Suite 300			
City: Greenville		State: SC	Zip Code: 29615
E-mail Address: RVandenMeiracker@trcsolutions.com		Phone No.: 864.234.9177	Cell No.: 864.787.5261
SC License/Registration No.: 28265			

K. LIST OF FORMS INCLUDED

Form Name	Included (Y/N)
Equipment/Processes (DHEC Form 2567)	☒ Yes
Control Devices (DHEC Form 2568)	☒ Yes ☐ No If No; Explain
Emissions (DHEC Form 2569)	☒ Yes
Regulatory Review (DHEC Form 2570)	☒ Yes
Modeling Information (DHEC Form 2573)	☒ Yes ☐ No If No, Explain
Expedited Review Request (DHEC Form 2212)	☒ Yes ☐ No

L. PROFESSIONAL ENGINEER SIGNATURE
I have placed my signature and seal on the engineering documents submitted, signifying that I have reviewed this construction permit application as it pertains to the requirements of *South Carolina Regulation 61-62, Air Pollution Control Regulations and Standards.*

SOUTH CAROLINA LICENSED PROFESSIONAL ENGINEER NO. 28265 ROBERT FRANCIS vandenMEIRACKER

Signature of Professional Engineer　　8/5/2014 Date

DHEC
PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Equipment / Processes

A. APPLICATION IDENTIFICATION	
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 – Revised 03/04/2014

B. PROJECT DESCRIPTION
Brief Project Description (What, why, how, etc.): #1 and #2 OX units: These units produce Terephthalic Acid (TA) by the air oxidation of p-Xylene (PX) in a acetic acid (HAC) solvent. The TA solid product is crystallized from the solvent, filtered, dried and sent to intermediate storage silos. A more complete description is included in sections 1 and 2 of the application.

C. ATTACHMENTS	
1. ☒ Process Flow Diagram	2. Location in Application: Located in Section 2 of the application
3. ☒ Detailed Project Description	4. Location in Application: Located in Section 1and 2 of the application

D. EQUIPMENT / PROCESS INFORMATION

1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
#1 OX		**Oxidation Unit**	**Confidential**				**PX/Air**	**TA**				
BR-301A	R	Reactor*	----	N/A	#1 HPVGTS	O-2/10/15	N/A	N/A	----	----	----	----
BR-301B	R	Reactor*	---	N/A	#1 HPVGTS	O-2/10/15	N/A	N/A	----	----	----	----
BR-301C	R	Reactor*	---	N/A	#1 HPVGTS	O-2/10/15	N/A	N/A	----	----	----	----
BR-301D	R	Reactor*	---	N/A	#1 HPVGTS	O-2/10/15	N/A	N/A	----	----	----	----
BT-605	R	Solvent Stripper	---	N/A	N/A	N/A	N/A	N/A	----	----	----	----
BM-606	R	Residue Evaporator	---	N/A	N/A	N/A	N/A	N/A	----	----	----	----
BD-625	R	CRU- Extraction Drum	---	N/A	N/A	O-11	N/A	N/A	----	----	----	----
BD-631	R	CRU - ML Drum	---	N/A	N/A	O-12	N/A	N/A	----	----	----	----
BD-632	R	CRU-Solid Reslurry Drum	---	N/A	N/A	O-13	N/A	N/A	----	----	----	----
BE-645	R	CRU - Condenser	---	N/A	N/A	O-16	N/A	N/A	----	----	----	----
BC-710	R	LPVGT	---	N/A	N/A	N/A	N/A	N/A	----	----	----	----
BR-301	N	Reactor*	---	N/A	#1 HPVGTS	O-2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
BT-701	M	Dehydration Tower	---	N/A	N/A	O-3	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
BD-401	M	1st Crystallizer	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-603	M	Low Pressure Absorber	---	N/A	N/A	O-3	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
BC-104	M	Power Recovery Expander	---	N/A	N/A	O-2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
BD-200	N	PX Feed Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BC-906	N	60# Steam Generator**	**Confidential**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-400	M	PX Scrubber	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

D. EQUIPMENT / PROCESS INFORMATION												
1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
BT-401	M	HP Absorber	---	N/A	#1 HPVGTS	O-2/10/15	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
BD-604	M	Azeo Storage Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-700	N	Liquid-Liquid Extraction Tower	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BM-1107	N	ROG Chiller	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BF-1405	N	NBA Storage Tank	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BT-750	N	Entrainer Recovery Tower	---	N/A	N/A	O-3	N/A	N/A	N/A	N/A	N/A	N/A
BD-204	M	Feed Mix Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BD-503	M	Filter Vacuum Sep. Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BM-1101A/B	M	Off-Gas Dryer	---	N/A	N/A	O-2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
BM-1101C/D	M	Off-Gas Dryer	---	N/A	N/A	O-2/10/15	N/A	N/A	N/A	N/A	N/A	N/A
BM-1201	M	Emergency Generator	400 KW	Diesel	N/A	O-17	N/A	N/A	NSPS IIII	NSPS IIII	NSPS IIII	NSPS IIII
BM-1204	N	Emergency Generator	550 KW	Diesel	N/A	O-24	N/A	N/A	NSPS IIII	NSPS IIII	NSPS IIII	NSPS IIII
#2 OX		**Oxidation Unit**	**Confidential**	**NG**			**PX/Air**	**TA**				
DC-710	R	LPVGT	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-402	R	Solvent Stripper	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DM-403	R	Residue Evaporator	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DD-412	R	CRU Extraction Drum	---	N/A	N/A	O2-6	N/A	N/A	N/A	N/A	N/A	N/A
DD-413	R	CRU Slurry Drum	---	N/A	N/A	O2-7	N/A	N/A	N/A	N/A	N/A	N/A
DD-414	R	CRU ML Drum	---	N/A	N/A	O2-8	N/A	N/A	N/A	N/A	N/A	N/A
DE-416	R	CRU Evap OH Condenser	---	N/A	N/A	O2-9	N/A	N/A	N/A	N/A	N/A	N/A
DT-404	R	PX Stripper	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
DT-403	M	Dehydration Tower	---	N/A	N/A	O2-1	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
DT-302	M	Low Pressure Absorber	---	N/A	N/A	O2-1	N/A	N/A	HON MACT	HON MACT	HON MACT	HON MACT
DC-104	M	Power Recovery Expander	---	N/A	N/A	O2-3/4	N/A	N/A	N/A	N/A	N/A	N/A
DD-402	M	Azeo Storage Drum	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-400	N	Liquid-Liquid Extraction Tower	------	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DT-404	N	DHT Scrubber	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
DF-460	N	NBA Storage Tank	---	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

D. EQUIPMENT / PROCESS INFORMATION												
1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
DT-450	N	Entrainer Recovery Tower	---	N/A	N/A	O2-1	N/A	N/A	N/A	N/A	N/A	N/A
DC-906	N	60# Steam Generator**	**Confidential**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
NOTES												
*		Reactor includes overhead condensers										
**		60# Steam Generator will only provide power for internal use.										

Bureau of Air Quality
Construction Permit Application
Equipment / Processes

A. APPLICATION IDENTIFICATION	
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 - Revised 3/04/2014

B. PROJECT DESCRIPTION
Brief Project Description (What, why, how, etc.): #1 and #2 PTA units: These units produce Purified Terephthalic Acid (PTA) by the hydrogenation of the TA in a water slurry to change the impurities into a compound that can be seperated from the TA to improve its purity. The PTA product is separated from the impurities, dried and sent to storage silos. A more complete description is included in sections 1 and 2 of the application.

C. ATTACHMENTS	
1. ☒ Process Flow Diagram	2. Location in Application: Located in Section 2 of the application
3. ☒ Detailed Project Description	4. Location in Application: Located in Section 1and 2 of the application

D. EQUIPMENT / PROCESS INFORMATION

1. Equipment ID / Process ID	2. Action	3. Equipment / Process Description	4. Maximum Design Capacity (Units)	5. Fuels Combusted	6. Control Device ID(s)	7. Emission Point ID(s)	8. Raw Material(s)	9. Product(s)	10. Pollutant(s)/ Parameter(s) Monitored	11. Monitoring Frequency	12. Reporting Frequency	13. Monitoring / Reporting Basis
#1 PTA		**PTA Unit**	**117.5 tph**	**N/A**			**TA/H2**	**PTA**				
CM-301	M	Crystallizer Vent Scrubber	----	N/A	N/A	P-2	N/A	N/A	PM/ Pressure	Daily	Semiannual	CAM Plan
CD-304	N	Crystallizer	----	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
#2 PTA		**PTA Unit**	**88 TPH**	**N/A**			**TA/H2**	**PTA**				
DM-601	M	Crystallizer Vent Scrubber	----	N/A	N/A	P2-2	N/A	N/A	PM/Flow	Continuous	Semiannual	CAM Plan

PROMOTE PROTECT PROSPER
South Carolina Department of Health and Environmental Control

A. APPLICATION IDENTIFICATION	
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 - Revised 3/04/2014

B. CONTROL DEVICE INFORMATION

1. Control Device ID	2. Action	3. Pollutants Controlled (Include CAS#)	4. Control Device Description	5. Maximum Design Capacity (Units)	6. Fuels Combusted	7. Inherent/ Required/ Voluntary (Explain)	8. Capture System Efficiency and Description	9. Destruction/ Removal Efficiency Determination	10. Pollutant(s)/ Parameter(s) Monitored	11. Averaging Period(s)	12. Monitoring Frequency	13. Reporting Frequency	14. Monitoring/ Reporting Basis
CD – BE-645	R	VOC	Condenser	N/A	N/A	----	----	----	----	----	----	----	----
CD – CM-301	M	PM	Venturi Scrubber	N/A	N/A	R	100-Hard Piped	95-Stack Test	Pressure	N/A	Daily	Semiannual	Per CAM Plan
CD – DE-416	R	VOC	Condenser	N/A	N/A	----	----	----	----	----	----	----	----
CD – DM-601	M	PM	Venturi Scrubber	N/A	N/A	R	100-Hard Piped	95-Stack Test	Flow	N/A	Continuous	Semiannual	Per CAM Plan
CD -													
CD -													
CD -													
CD -													
CD -													
CD -													

A. APPLICATION IDENTIFICATION	
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013-Revised 03/04/2014 and 07/28/2014

B. ATTACHMENTS	
1. ☒ Sample Calculations, Emission Factors Used, etc.	2. ☐ Detailed Explanation of Assumptions, Bottlenecks, etc.
3. ☐ Supporting Information: Manufacturer's Data, etc.	4. ☐ Source Test Information
5. ☐ Details on Limits Being Taken for Limited Emissions	6. ☒ NSR Analysis

C. SUMMARY OF PROJECTED CHANGE IN FACILITY WIDE POTENTIAL EMISSIONS
(Calculated at maximum design capacity.)

1. **Pollutants**	2. **Emission Rates Prior to Construction / Modification (tons/year)**			3. **Emission Rates After Construction / Modification (tons/year)**		
	Uncontrolled	**Controlled**	**Limited**	**Uncontrolled**	**Controlled**	**Limited**
Particulate Matter (PM)	5,617.2	81.8	----	5,394.2	77.1	----
Particulate Matter <10 Microns (PM_{10})	5,589.7	78.0	----	5,356.2	73.0	----
Particulate Matter <2.5 Microns ($PM_{2.5}$)	5,522.7	73.8	----	5,261.6	67.9	----
Sulfur Dioxide (SO_2)	193.8	189.1	----	190.9	189.0	----
Nitrogen Oxides (NO_x)	475.9	324.6	----	495.7	324.9	----
Carbon Monoxide (CO)	17,113.9	2,533.8	----	14,820.5	1233.0	----
Volatile Organic Compounds (VOC)	2513.9	761.3	----	2587.2	576.5	----
Lead (Pb)	1.0	1.0	----	1.0	1.0	----
Greenhouse Gases (Mass Basis)	487,767	512,580	----	482,000	479,586	----
Greenhouse Gases (CO_2e Basis)	488,196	513,031	----	484,519	480,031	----
Highest HAP Prior to Construction (CAS #: 106-42-3)	430.8	47.3	----	----	----	----
Highest HAP After Construction (CAS #: 106-42-3)	----	----	----	227.9	58.5	----
Total HAP Emissions*	2,548.4	279.8	----	1688.1	128.6	----

(*All HAP emitted from the various equipment or processes must be listed in the appropriate "Table D. Potential Emission Rates at Maximum Design Capacity.")

D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
1. **Equipment ID / Process ID**	2. **Emission Point ID**	3. **Pollutants** (Include CAS #.)	4. **Calculation Methods / Limits Taken / Other Comments**	5. **Uncontrolled**		6. **Controlled**		7. **Limited**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**	**lbs/hr**	**tons/yr**
BM-1201	O-17	NO_X 11104-93-1	See Appendix B	5.86	25.7	5.86	0.3		
BM-1201	O-17	VOC	See Appendix B	0.07	0.3	0.07	0.003		
BM-1201	O-17	CO 630-08-0	See Appendix B	0.37	2.6	0.37	0.03		
BM-1201	O-17	SO_2 7446-09-5	See Appendix B	0.01	0.04	0.01	0.0005		
BM-1201	O-17	PM	See Appendix B	0.06	0.3	0.06	0.003		
BM-1201	O-17	PM_{10}	See Appendix B	0.06	0.3	0.06	0.003		
BM-1201	O-17	$PM_{2.5}$	See Appendix B	0.06	0.3	0.06	0.003		
BM-1201	O-17	CO_2e 124-38-9	See Appendix B	313.1	1371.2	313.1	15.7		
BM-1204	O-23	NO_X 11104-93-1	See Appendix B	9.03	39.6	9.03	0.5		
BM-1201	O-17	VOC	See Appendix B	0.02	0.1	0.02	0.001		
BM-1201	O-17	CO 630-08-0	See Appendix B	0.57	2.5	0.57	0.03		
BM-1201	O-17	SO_2 7446-09-5	See Appendix B	0.01	0.04	0.01	0.0004		
BM-1201	O-17	PM	See Appendix B	0.05	0.2	0.05	0.003		
BM-1201	O-17	PM_{10}	See Appendix B	0.05	0.2	0.05	0.003		
BM-1201	O-17	$PM_{2.5}$	See Appendix B	0.05	0.2	0.05	0.003		
BM-1201	O-17	CO_2e 124-38-9	See Appendix B	302.8	1326.2	302.8	15.1		
#1 HPVGTS	O-2/10/15	VOC	See Appendix B	234	1025	4.7	20.5		
#1 HPVGTS	O-2/10/15	CO 630-08-0	See Appendix B	1758	7700	87.9	385.0		
#1 HPVGTS	O-2/10/15	CO_2e 124-38-9	See Appendix B	9521	41,700	9521	41,700		
BT-603	O-3	VOC	See Appendix B	9.6	42.0	9.6	42.0		
BT-603	O-3	CO 630-08-0	See Appendix B	4.1	18.0	4.1	18.0		

D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
1. **Equipment ID / Process ID**	2. **Emission Point ID**	3. **Pollutants** (Include CAS #.)	4. **Calculation Methods / Limits Taken / Other Comments**	5. **Uncontrolled**		6. **Controlled**		7. **Limited**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**	**lbs/hr**	**tons/yr**
BT-603	O-3	CO_2e 124-38-9	See Appendix B	283.0	1240	283.0	1240		
BT-501	O-22	PM	See Appendix B	75	330	1.50	6.6		
BT-501	O-22	PM_{10}	See Appendix B	75	330	1.50	6.6		
BT-501	O-22	$PM_{2.5}$	See Appendix B	75	330	1.50	6.6		
#1 OX Fugitives	N/A	p-Xylene 106-42-3	See Appendix B	1.9	8.1	0.20	0.9		
#1 OX Fugitives	N/A	Formaldehyde 50-00-0	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Methanol 67-56-1	See Appendix B	0.01	0.02	0.001	0.002		
#1 OX Fugitives	N/A	Benzene 71-43-2	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Toluene 108-88-3	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Methyl Bromide 74-83-9	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Acetaldehyde 75-07-0	See Appendix B	0	0	0	0		
#1 OX Fugitives	N/A	Acetic Acid 64-19-7	See Appendix B	45.1	197.5	4.8	21.1		
DM-135	O2-10	NO_X 11104-93-1	See Appendix B	25.75	6.44	25.75	6.44		
DM-135	O2-10	VOC	See Appendix B	0.69	0.17	0.69	0.17		
DM-135	O2-10	CO 630-08-0	See Appendix B	5.90	1.48	5.90	1.48		
DM-135	O2-10	SO_2 7446-09-5	See Appendix B	0.43	0.11	0.43	0.11		
DM-135	O2-10	PM	See Appendix B	0.75	0.19	0.75	0.19		
DM-135	O2-10	PM_{10}	See Appendix B	0.75	0.19	0.75	0.19		
DM-135	O2-10	$PM_{2.5}$	See Appendix B	0.75	0.19	0.75	0.19		

D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
1. **Equipment ID / Process ID**	2. **Emission Point ID**	3. **Pollutants** (Include CAS #.)	4. **Calculation Methods / Limits Taken / Other Comments**	5. **Uncontrolled**		6. **Controlled**		7. **Limited**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**	**lbs/hr**	**tons/yr**
DM-135	O2-10	CO_2e 124-38-9	See Appendix B	440.8	110.2	440.8	110.2		
DB-1813	O2-2	NO_X 11104-93-1	See Appendix B	1.47	6.4	1.47	6.4		
DB-1813	O2-2	VOC	See Appendix B	0.08	0.4	0.08	0.4		
DB-1813	O2-2	CO 630-08-0	See Appendix B	1.24	5.4	1.24	5.4		
DB-1813	O2-2	SO_2 7446-09-5	See Appendix B	0.01	0.04	0.01	0.0		
DB-1813	O2-2	PM	See Appendix B	0.11	0.5	0.11	0.5		
DB-1813	O2-2	PM_{10}	See Appendix B	0.11	0.5	0.11	0.5		
DB-1813	O2-2	$PM_{2.5}$	See Appendix B	0.11	0.5	0.11	0.5		
DB-1813	O2-2	CO_2e 124-38-9	See Appendix B	1755	7,687	175	7,687		
#2 HPVGTS	O2-3/4	VOC	See Appendix B	175.0	766.5	3.50	15.3		
#2 HPVGTS	O2-3/4	CO 630-08-0	See Appendix B	1500.0	6571.5	75.0	329.0		
#2 HPVGTS	O2-3/4	CO_2e 124-38-9	See Appendix B	2300	10,074	2300	10,074		
DT-302	O2-1	VOC	See Appendix B	8.85	38.8	8.85	38.8		
DT-302	O2-1	CO 630-08-0	See Appendix B	3.47	15.2	3.47	15.2		
DT-302	O2-1	CO_2e 124-38-9	See Appendix B	231.7	1,015	231.7	1,015		
DT-500	O2-5	PM	See Appendix B	10	50	0.10	0.5		
DT-500	O2-5	PM_{10}	See Appendix B	10	50	0.10	0.5		
DT-500	O2-5	$PM_{2.5}$	See Appendix B	10	50	0.10	0.5		
#2 OX Fugitives	N/A	p-Xylene 106-42-3	See Appendix B	2.2	9.4	0.2	1.0		
#2 OX Fugitives	N/A	Formaldehyde 50-00-0	See Appendix B	0	0	0	0		

D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
1. **Equipment ID / Process ID**	2. **Emission Point ID**	3. **Pollutants** (Include CAS #.)	4. **Calculation Methods / Limits Taken / Other Comments**	5. **Uncontrolled**		6. **Controlled**		7. **Limited**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**	**lbs/hr**	**tons/yr**
#2 OX Fugitives	N/A	Methanol 67-56-1	See Appendix B	0.006	0.03	0.001	0.003		
#2 OX Fugitives	N/A	Benzene 71-43-2	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Toluene 108-88-3	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Methyl Bromide 74-83-9	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Acetaldehyde 75-07-0	See Appendix B	0	0	0	0		
#2 OX Fugitives	N/A	Acetic Acid 64-19-7	See Appendix B	46.2	202.5	4.8	21.2		
CM-301	P-2	VOC	See Appendix B	20.0	87.6	20.0	87.6		
CM-301	P-2	CO	See Appendix B	24.0	105.1	24.0	105.1		
CM-301	P-2	PM	See Appendix B	121	530	1.21	5.3		
CM-301	P-2	PM_{10}	See Appendix B	121	530	1.21	5.3		
CM-301	P-2	$PM_{2.5}$	See Appendix B	121	530	1.21	5.3		
CM-404 A/B	P-3 A/B	PM	See Appendix B	30 each	131.4 each	0.3 each	1.3 each		
CM-404 A/B	P-3 A/B	PM_{10}	See Appendix B	30 each	131.4 each	0.3 each	1.3 each		
CM-404 A/B	P-3 A/B	$PM_{2.5}$	See Appendix B	30 each	131.4 each	0.3 each	1.3 each		
CM-603 A/B	P-4 A/B	PM	See Appendix B	42.4 each	185.8 each	0.42 each	1.9 each		
CM-603 A/B	P-4 A/B	PM_{10}	See Appendix B	42.4 each	185.8 each	0.42 each	1.9 each		
CM-603 A/B	P-4 A/B	$PM_{2.5}$	See Appendix B	42.4 each	185.8 each	0.42 each	1.9 each		
CM-608 A/B	P-17/18	PM	See Appendix B	0.86 each	3.8 each	0.01 each	0.04 each		
CM-608 A/B	P-17/18	PM_{10}	See Appendix B	0.86 each	3.8 each	0.01 each	0.04 each		
CM-608 A/B	P-17/18	$PM_{2.5}$	See Appendix B	0.86 each	3.8 each	0.01 each	0.04 each		
CD-405	P-14	PM	See Appendix B	10	43.8	0.1	0.4		
CD-405	P-14	PM_{10}	See Appendix B	10	43.8	0.1	0.4		
CD-405	P-14	$PM_{2.5}$	See Appendix B	10	43.8	0.1	0.4		
DM-601	P2-2	VOC	See Appendix B	20.0	87.6	20.0	87.6		

D. POTENTIAL EMISSION RATES AT MAXIMUM DESIGN CAPACITY									
1. **Equipment ID / Process ID**	2. **Emission Point ID**	3. **Pollutants** (Include CAS #.)	4. **Calculation Methods / Limits Taken / Other Comments**	5. **Uncontrolled**		6. **Controlled**		7. **Limited**	
				lbs/hr	**tons/yr**	**lbs/hr**	**tons/yr**	**lbs/hr**	**tons/yr**
DM-601	P2-2	CO	See Appendix B	20.0	87.6	20.0	87.6		
DM-601	P2-2	PM	See Appendix B	54	236.5	0.54	2.4		
DM-601	P2-2	PM_{10}	See Appendix B	54	236.5	0.54	2.4		
DM-601	P2-2	$PM_{2.5}$	See Appendix B	54	236.5	0.54	2.4		
DD-500/DH-518	P2-1	PM	See Appendix B	4	17.5	0.04	0.2		
DD-500/DH-518	P2-1	PM_{10}	See Appendix B	4	17.5	0.04	0.2		
DD-500/DH-518	P2-1	$PM_{2.5}$	See Appendix B	4	17.5	0.04	0.2		
DM-704	P2-3	PM	See Appendix B	5.2	22.8	0.26	1.1		
DM-704	P2-3	PM_{10}	See Appendix B	5.2	22.8	0.26	1.1		
DM-704	P2-3	$PM_{2.5}$	See Appendix B	5.2	22.8	0.26	1.1		
DM-797 A/B	P2-4 A/B	PM	See Appendix B	265 each	1161 each	0.27 each	1.2 each		
DM-797 A/B	P2-4 A/B	PM_{10}	See Appendix B	265 each	1161 each	0.27 each	1.2 each		
DM-797 A/B	P2-4 A/B	$PM_{2.5}$	See Appendix B	265 each	1161 each	0.27 each	1.2 each		

D H E C
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South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Construction Permit Application
Regulatory Review

A. APPLICATION IDENTIFICATION	
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 – Revised 3/04/2014

B. SOUTH CAROLINA AIR POLLUTION CONTROL REGULATIONS AND STANDARDS
(If not listed below add any additional regulations that are triggered.)

1. **Regulation**	2. **Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	3. **Explain Applicability Determination**	4. **List the specific limitations and/or requirements that apply.**	5. **How will compliance be demonstrated?**
Regulation 61-62.1, Section II(E) Synthetic Minor Construction Permits	☐	☒	Major Source	N/A	N/A
Regulation 61-62.1, Section II(G) Conditional Major Operating Permits	☐	☒	Title V Source	N/A	N/A
Regulation 61-62.5, Standard No. 1 Emissions from Fuel Burning Operations	☐	☒	No new or modified fuel burn sources	N/a	N/A
Regulation 61-62.5, Standard No. 2 Ambient Air Quality Standards	☒	☐	No changes to PTE previously modeled, CO modeling below SIL	N/A	N/A
Regulation 61-62.5, Standard No. 3 Waste Combustion and Reduction	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.5, Standard No. 3.1 Hospital, Medical, Infections Waste Incinerators (HMIWI)	☐	☒	No applicable sources at facility	N/A	N/A
Regulation 61-62.5, Standard No. 4 Emissions from Process Industries	☒	☐	PM sources- the PWR is unchanged	No Change from present	No Change from present
Regulation 61-62.5, Standard No. 5 Volatile Organic Compounds	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.5, Standard No. 5.1 BACT/LAER Applicable to VOC	☒	☒	VOC increase is less than 100 tpy per PSD analysis	N/A	N/A
Regulation 61-62.5, Standard No. 5.2 Control of Oxides of Nitrogen	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.5, Standard No. 7 Prevention of Significant Deterioration	☒	☐	PSD Permit application		
Regulation 61-62.5, Standard No. 7.1 Nonattainment New Source Review	☐	☒	Not a non-attainment area	N/A	N/A
Regulation 61-62.5, Standard No. 8 Toxic Air Pollutants	☐	☒	Exempt per section 1(d) since all sources covered by a MACT	N/A	N/A

B. SOUTH CAROLINA AIR POLLUTION CONTROL REGULATIONS AND STANDARDS (If not listed below add any additional regulations that are triggered.)					
1. **Regulation**	2. **Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	3. **Explain Applicability Determination**	4. **List the specific limitations and/or requirements that apply.**	5. **How will compliance be demonstrated?**
Regulation 61-62.6 Control of Fugitive Particulate Matter	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.68 Chemical Accident Prevention Provisions	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.70 Title V Operating Permit Program	☒	☐	Title V Modification	Revise Title V permit	Submit application
Regulation 61-62.72 Acid Rain	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.96 Nitrogen Oxides Budget Trading Program	☐	☒	No new or modified sources	N/A	N/A
Regulation 61-62.99 Nitrogen Oxides Budget Program Requirements for Stationary Sources Not In the Trading Program	☐	☒	No new or modified sources	N/A	N/A

C. 40 CFR PART 60 - STANDARDS OF PERFORMANCE FOR NEW STATIONARY SOURCES (If not listed below add any additional regulations that are triggered.)					
1. **Subpart and Title**	2. **Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	3. **Explain Applicability Determination**	4. **List the specific limitations and/or requirements that apply.**	5. **How will compliance be demonstrated?**
Subpart A - General Provisions	☒	☐	New or modified sources subject		
NNN	☒	☐	New sources	Maintain TRE from recovery device above 8	Monitor recovery per regulation to maintain TRE
III	☒	☐	New reactor on #1 OX	Maintain TRE from recovery device above 4	Monitor recovery per regulation to maintain TRE
VV	☒	☐	New components	Will comply by HON LDAR	HON LDAR monitoring
VVa	☐	☐	New components	Will comply by HON LDAR	HON LDAR monitoring
	☐	☐			
	☐	☐			
	☐	☐			
	☐	☐			

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Bureau of Air Quality
Construction Permit Application
Regulatory Review

D. 40 CFR PART 61 - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS (If not listed below add any additional regulations that are triggered.)					
1. **Subpart and Title**	2. **Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	3. **Explain Applicability Determination**	4. **List the specific limitations and/or requirements that apply.**	5. **How will compliance be demonstrated?**
Subpart A - General Provisions	☐	☒	No new or modified sources	N/A	N/A
M	☐	☐	General for facility demo work	Proper handling of asbestos	Proper handling methods
FF	☐	☐	Need to re-evaluate TAB	Re-evaluate TAB < 1 Mg	TAB calculation
	☐	☐			
	☐	☐			

E. 40 CFR PART 63 - NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS FOR SOURCE CATEGORIES (If not listed below add any additional regulations that are triggered.)					
1. **Subpart and Title**	2. **Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	3. **Explain Applicability Determination**	4. **List the specific limitations and/or requirements that apply.**	5. **How will compliance be demonstrated?**
Subpart A - General Provisions	☒	☐	New or modified sources		
F		☐	New or modified sources		
G	☒	☐	New or modified sources	Maintain TRE of process vents	Monitor per HON regulation
H	☒	☐	New or modified sources	Have a LDAR program	Monitor & Report per HON
DDDDD	☒	☐	Applicable to equipment but no new or modified sources	No new limits or requirements	Burn only gas
GGGGG	☒	☐	Will be triggered if remediation occurs due to project	Comply with appropriate standards	Meet appropriate monitoring and reporting requirement of regulation
	☐	☐			
	☐	☐			

F. OTHER (If not listed below add any additional regulations, enforcement requirement, permitting requirement, etc. that are triggered.)					
1. **Regulation and Title / Other**	2. **Applicable**		**Include all limits, work practices, monitoring, record keeping, etc.**		
	Yes	**No**	3. **Explain Applicability Determination**	4. **List the specific limitations and/or requirements that apply.**	5. **How will compliance be demonstrated?**
40 CFR Part 64 - Compliance Assurance Monitoring (CAM)	☒	☐	New or modified sources	Update CAM plan as necessary	Monitor per CAM plan & report
	☐	☐			

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South Carolina Department of Health and Environmental Control

Bureau of Air Quality
Modeling Information

A. APPLICATION IDENTIFICATION	
1. Facility Name: BP Amoco Chemical Company - Cooper River Plant	
2. SC Air Permit Number (if known; 8-digits only): 0420 - 0029	3. Application Date: 4/09/2013 – Revised 3/04/2014
4. Project Description: BP CR Modernization/Debottleneck Project	

B. FACILITY INFORMATION	
1. Is your company a Small Business? ☐ Yes ☒ No	2. If a Small Business, is Bureau modeling assistance being requested? ☐ Yes ☒ No
3. Are other facilities co-modeled? ☐ Yes ☒ No	4. If Yes, provide permit numbers of co-modeled facilities:

C. AIR MODELING CONTACT			
Consulting Firm Name (if applicable): TRC Environmental			
Title/Position: Senior Environmental Specialist	Salutation: Mr.	First Name: David	Last Name: Fox
Mailing Address: Suite 3000 708 Heartland Trail			
City: Madison		State: Wi	Zip Code: 53717
E-mail Address: DFox@trcsolutions.com		Phone No.: 608-826-3622	Cell No.: 608-216-8986

D. REASON FOR MODELING
(Check all that apply.)

1. ☐ Modeling Not Required Explanation:

2. **Modeling/Pollutant**	**Particulate Matter <10 Microns (PM_{10})**	**Particulate Matter <2.5 Microns ($PM_{2.5}$)**	**Sulfur Dioxide (SO_2)**	**Nitrogen Oxides (NO_x)**	**Carbon Monoxide (CO)**	**Lead (Pb)**	**Hydrogen Fluoride (HF)**	**Air Toxics**	**Other**
Not Modeled	☒	☒	☒	☒	☐	☒	☒	☒	☐
Standard 2 AAQS	☐	☐	☐	☐	☐	☐	☐	N/A	☐
Standard 2 Exemption/Deferral	☐	☐	☐	☐	☐	☐	☐	N/A	☐
Standard 7 Increment	☐	☐	☐	☐	N/A	N/A	N/A	N/A	☐
Standard 7 Exemption/Deferral	☐	☐	☐	☐	N/A	N/A	N/A	N/A	☐
Standard 8 Air Toxics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	☐	☐
Standard 8 De Minimis / Exempt	N/A	N/A	N/A	N/A	N/A	N/A	N/A	☐	☐
NSR/PSD Project	☐	☐	☐	☐	☒	☐	☐	☐	☐
Air Compliance Demonstration	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. "Other" Reason for modeling	

E. EMISSION SOURCE DISPERSION PARAMETERS
Source data requirements are based on the appropriate source classification. Each emission source is classified as a point, area, volume, or flare source. Contact the Bureau of Air Quality for clarification of input data requirements. Include source on-site map. Also, a picture of area or volume sources would be helpful but is not required. A spreadsheet may be substituted in lieu of this form provided the required emission point parameters are submitted in the same order as presented in these tables.
Abbreviations / Units of Measure: UTM = Universal Transverse Mercator; °N = Degrees North; °W = Degrees West; m = meters; AGL = Above Ground Level; ft = feet; ft/s = feet per second; ° = Degrees; °F = Degrees Fahrenheit

F. POINT SOURCE DATA
(Point sources such as stacks, chimneys, exhaust fans, and vents.)

Emission Point ID	Description/Name	Stack Coordinates Projection: UTM83				Release Height AGL (ft)	Temp. (°F)	Exit Velocity (ft/s)	Inside Diameter (ft)	Discharge Orientation	Rain Cap? (Y/N)	Distance To Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (°W)								Height (ft)	Length (ft)	Width (ft)
BT_702	BT-702 DHT Scrubber	604625	3649190			35.00	90	69.9	1.00	V	N	964	54	62	51
BT_603	#1 OX LPA	604639	3649127			70.5	120	11.2	2.50	V	N	907	54	62	51
HPVGTS1	#1 Ox HPVGTS	604666.1	3649104.3			100.0	171	261.7	3.0	V	N	878	54	62	51
DT_302	#2 OX LPA	604565	3648820			80.0	95	3.2	3.5	V	N	590	32	44	29
HPVGTS2	#2 OX HPVGTS	604642.3	3648895.9			136.0	140	98.0	4.26	V	N	667	32	44	29

G. AREA SOURCE DATA
(Area sources such as storage piles, and other sources that have low level or ground level releases with no plumes.)

Emission Point ID	Description/Name	Area Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Angle From North (°)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)					
NA										

H. VOLUME SOURCE DATA
(Volume sources that have initial dispersion prior to release. Volume sources differ from area sources in that they have an initial dispersion vertical depth.)

Emission Point ID	Description/Name	Volume Source Coordinates Projection:				Release Height AGL (ft)	Initial Horizontal Dimension (ft)	Initial Vertical Dimension (ft)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)				
NA							‼ FORMTEXT		

South Carolina Department of Health and Environmental Control

Bureau of Air Quality Modeling Information

I. FLARE SOURCE DATA

(Point sources where the combustion takes place at the tip of the stack.)

Emission Point ID	Description/Name	Stack Coordinates Projection:				Release Height AGL (ft)	Heat Release Rate (BTU/hr)	Distance To Nearest Property Boundary (ft)	Building		
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)				Height (ft)	Length (ft)	Width (ft)
NA											

J. AREA CIRCULAR SOURCE DATA

Emission Point ID	Description/Name	Area Circular Source Coordinates Projection:				Release Height AGL (ft)	Radius of Area (ft)	Distance To Nearest Property Boundary (ft)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)			
NA								

K. AREA POLY SOURCE DATA

Emission Point ID	Description/Name	Area Poly Source Coordinates Projection:				Release Height AGL (ft)	Number of Vertices
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)		
NA				NA (See Instructions)			

L. OPEN PIT SOURCE DATA

Emission Point ID	Description/Name	Open Pit Source Coordinates Projection:				Release Height AGL (ft)	Easterly Length (ft)	Northerly Length (ft)	Volume (ft^3)	Angle From North (°)
		UTM E (m)	UTM N (m)	Lat (°N)	Long (° W)					
NA				NA (See Instructions)						

M. MODELED EMISSION RATES						
Emission Point ID	Pollutant Name	CAS #	Emission Rate (lb/hr)	Same as Permitted (1)	Controlled or Uncontrolled	Averaging Period
BT-702	CO		-87.0	☒ Yes ☐ No	Controlled	1,8
BT-603	CO		4.1	☐ Yes ☒ No	Controlled	1,8
#1 HPVGTS	CO		87.9	☐ Yes ☒ No	Controlled	1,8
DT-302	CO		3.5	☐ Yes ☒ No	Controlled	1,8
#2 HPVGTS	CO		75.0	☐ Yes ☒ No	Controlled	1,8
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		
				☐ Yes ☐ No		

(1) Any difference between the modeled rate and the permitted rate must be explained in the modeling report.

Appendix B
Emission Data and Calculations

PSD Analysis

Table B-1

Project Dragonslayer PSD Emissions Analysis Summary

Post-Project PTE Emissions (Before BACT) (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TANK FARM[1]	SHIPPING[1]	INC. STEAM[1]	TOTAL
NOx	0.7	12.9	0	0	0	0	0	17.3	30.9
VOC	156.9	150.3	87.6	87.6	0	4.2	0	1.2	487.8
CO	403.0	351.1	105.1	87.6	0	0	0	17.8	964.6
SO_2	0.00	0.1	0	0	0	0	0	0.1	0.3
PM	6.6	1.1	12.1	6.0	3.8	0	9.9	1.1	40.7
PM_{10}	6.6	1.1	12.1	6.0	2.8	0	9.9	1.1	39.6
$PM_{2.5}$	6.6	1.1	12.1	6.0	0.01	0	9.9	1.1	36.8
CO_2e	42,971	18,886	0	0	0	0	0	25,265	87,122

(1) These units will not be modified. Tank Farm and Shipping are debottlenecked and incremental steam from boiler.

Baseline Actual Average 2010-2011 Emissions (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TANK FARM	SHIPPING	INC. STEAM	TOTAL
NOx	0.2	2.9	0	0	0	0	0	0	3.1
VOC	124.7	111.9	40.7	42.0	0	4.1	0	0	323.4
CO	275.1	71.6	0	0	0	0	0	0	346.7
SO_2	0.01	0.03	0	0	0	0	0	0	0.04
PM	3.3	0.6	12.9	5.4	2.7	0	8.8	0	33.7
PM_{10}	3.3	0.6	12.9	5.4	1.9	0	8.8	0	33.0
$PM_{2.5}$	3.4	0.6	12.9	5.4	0.01	0	8.8	0	31.1
CO_2e	38,807	30,987	0	0	0	0	0	0	69,793

Step 1 - Project Pollutant Increases Above PSD Significance

POLLUTANTS	VOC	CO	NOx	SO_2	PM	PM_{10}	$PM_{2.5}$	CO_2e
TOTAL PTE	487.8	964.6	30.9	0.3	40.7	39.6	36.8	87,122
TOTAL BASELINE	323.4	346.7	3.1	0.04	33.7	33.0	31.1	69,793
DELTA	164.4	617.9	27.8	0.2	7.0	6.6	5.8	17,328
PSD SIGNIFICANCE	40	100	40	40	25	15	10	75,000
ABOVE PSD	**Yes**	**Yes**	No	No	No	No	No	No

Table B-1
Project Dragonslayer PSD Emissions Analysis Summary

Step 2 - Facility Netting

POLLUTANTS	VOC	CO	NOx	SO_2	PM	PM_{10}	$PM_{2.5}$	CO_2e
STEP 1 DELTA	164.4	617.9	27.8	0.2	7.0	6.6	5.8	17,328
TOTAL CONTEMPORANEOUS	35.8	26.9	N/A	N/A	N/A	N/A	N/A	N/A
NET EMISSIONS	200.3	644.8	27.8	0.2	7.0	6.6	5.8	17,328
PSD SIGNIFICANCE	40	100	40	40	25	15	10	75,000
ABOVE PSD	**Yes**	**Yes**	No	No	No	No	No	No

Contemporaneous Emissions

PROJECT	YEAR	CO (tpy)	VOC (tpy)
502b10 - CR #1 Ox BR-301A Alternate Water Withdrawl	2008	0.0	0
PTA FIP Project (Permit CS)	2008	0.01	8.24
502b10 - #1 OX/PTA Op Flex	2011	0	0
PTA BHS Filter Project	2012	26.9	27.6
Total	---	26.9	35.8

Post-Project PTE Emissions (After BACT) (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	COOLING TOWER	TANK FARM(1)	SHIPPING(1)	INC. STEAM(1)	TOTAL
NOx	0.7	12.9	0	0	0	0	0	17.3	30.9
VOC	84.5	76.8	87.6	87.6	0	4.2	0	1.2	341.9
CO	403.0	351.1	105.1	87.6	0	0	0	17.8	964.6
SO_2	0.0	0.1	0	0	0	0	0	0.1	0.3
PM	6.6	1.1	12.1	6.0	3.8	0	9.9	1.1	40.7
PM_{10}	6.6	1.1	12.1	6.0	2.8	0	9.9	1.1	39.6
$PM_{2.5}$	6.6	1.1	12.1	6.0	0.01	0	9.9	1.1	36.8
CO_2e	42,971	18,886	0	0	0	0	0	25265.0	87,122

(1) These units will not be modified. Tank Farm and Shipping are debottlenecked and incremental steam from boiler.

Table B-2
CR #1 OX PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	762	NOx	0.00769	lb/hp-hr	Manufacturer Data	5.86	100	0.3	Diesel Fuel Sulfur = 15 ppm, Hours per RICE MACT limit
			VOC	0.00009	lb/hp-hr	Manufacturer Data	0.07	100	0.003	
			CO	0.00077	lb/hp-hr	Manufacturer Data	0.59	100	0.03	
			SO_2	0.00001	lb/hp-hr	Manufacturer Data	0.01	100	0.0005	
			PM	0.00007	lb/hp-hr	Manufacturer Data	0.06	100	0.003	
			PM_{10}	0.00007	lb/hp-hr	Manufacturer Data	0.06	100	0.003	
			$PM_{2.5}$	0.00007	lb/hp-hr	Manufacturer Data	0.06	100	0.003	
			CO_2e	163.6	lb/MMBtu	USEPA Data	313.067	100	15.7	
Emergency Generator #4	BM-1204	737	NOx	0.01226	lb/hp-hr	Manufacturer Data	9.03	100	0.5	Diesel Fuel Sulfur = 15 ppm, Hours per RICE MACT limit
			VOC	0.00002	lb/hp-hr	Manufacturer Data	0.02	100	0.001	
			CO	0.00077	lb/hp-hr	Manufacturer Data	0.57	100	0.03	
			SO_2	0.00001	lb/hp-hr	Manufacturer Data	0.01	100	0.0004	
			PM	0.00007	lb/hp-hr	Manufacturer Data	0.05	100	0.003	
			PM_{10}	0.00007	lb/hp-hr	Manufacturer Data	0.05	100	0.003	
			$PM_{2.5}$	0.00007	lb/hp-hr	Manufacturer Data	0.05	100	0.003	
			CO_2e	163.6	lb/MMBtu	USEPA Data	302.795	100	15.1	
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lb/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EMISSION FACTOR**	**UNITS**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**PERMITTED OPERATING (hpy)**	**ANNUAL EMISSIONS (tpy)**	**COMMENTS**
HPVGTS	HPVGTS-1	234	VOC*	98.0	% Removal	BP design Calcs	4.7	8,760	20.5	Maximum rate based on BP design calculations. See emission footnote
		1758	CO*	95.0	% Removal		87.9	8,760	385.0	
		9520.6	CO_2e	0	% Removal	BP calc/USEPA EF	9,520.6	8,760	41,700	
Low Pressure Absorber	BT-603	9.6	VOC*			BP design Calcs	9.6	8,760	42.0	Maximum rate based on BP design calculations. See emission footnote
		4.1	CO*				4.1	8,760	18.0	
		283.0	CO_2e			BP calc/USEPA EF	283.0	8,760	1240	
CRU Extraction Drum	BD-625	**CRU removed**	VOC							**CRU is being removed**
CRU Surge Drum	BD-631		VOC							
CRU Waste Slurry Drum	BD-632		VOC							
Silo Scrubber	BT-501	75	PM*	98	% Removal	Average data from 12/04 source test adjusted for higher feed rates	1.50	8,760	6.6	Maximum rate based on hourly emissions and % removal. See emission footnote
			PM_{10}	98	% Removal		1.50	8,760	6.6	
			$PM_{2.5}$	98	% Removal		1.50	8,760	6.6	
CRU Evaporator Overhd Condenser	BE-645	**CRU removed**	VOC							**CRU being removed**
DHT Ovhd Scrubber	BT-702	**Vent Removed**	VOC							**Vent Removed**
			CO							
			CO_2e							
Process Fugitives			VOC			USEPA LDAR EF	21.5	8,760	94.4	

*** Emission Revision Comments**

HPVGTS - VOC	The % removal efficiency in this application was revised from the efficiency used in past construction applications, This application uses the true potential efficiency.
HPVGTS - CO	The % removal efficiency in this application was revised from the efficiency used in past construction applications, This application uses the true potential efficiency.
LPA - VOC & CO	The hourly emissions rates are revised based on the new flow scheme after the project and improvements to the LPA
Silo - PM	The emission rate has been revised based on changing to high density conveying

Table B-2
CR #1 OX PSD Analysis

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	33	0.2	Diesel Fuel Sulfur = 0.05%
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	33	0.01	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	33	0.04	
			SO_2	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	33	0.01	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	33	0.01	
			PM_{10}	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	33	0.01	
			$PM_{2.5}$	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	33	0.01	
			CO_2e	163.6	lb/MMBtu	USEPA Data	137.634	33	2.3	
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lb/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EMISSION FACTOR**	**UNITS**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**ACTUAL OPERATING (hpy)**	**ANNUAL EMISSIONS (tpy)**	**COMMENTS**
HPVGTS	HPVGTS-1		VOC			Emission Inventory	3	8,291	13.5	
			CO				77	8,291	319.8	
			CO_2e			emission Inventory/ EPA EF	9504	8,291	39,398.4	
Low Pressure Absorber	BT-603		VOC			Emission Inventory	5	8,291	22.0	
			CO				1	8,291	3.9	
			CO_2e			emission Inventory/ EPA EF	110	8,291	457.2	
CRU Extraction Drum	BD-625		VOC			Emission Inventory	1.0	8,291	4.1	
CRU Surge Drum	BD-631		VOC			Emission Inventory	4.0	8,291	16.6	
CRU Waste Slurry Drum	BD-632		VOC			Emission Inventory	0.003	8,291	0.01	
Silo Scrubber	BT-501		PM	98	% Removal	Average of data from 12/04 source test	0.84	8,291	3.5	
			PM_{10}	98	% Removal		0.84	8,291	3.5	
			$PM_{2.5}$	98	% Removal		0.84	8,291	3.5	
CRU Evaporator Overhd Condenser	BE-645		VOC			Emission Inventory	0.3	8,291	1.2	
DHT Ovhd Scrubber	BT-702		VOC			Emission Inventory	20.6	62	0.6	Based on hours vent open
			CO				76.5	62	2.4	
			CO_2e			BP calcs/EPA EF	534.1	62	16.6	
Process Fugitives			VOC			USEPA LDAR EF	19.8	8,291	82.1	

Table B-2
CR #1 OX PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	44	0.2	Diesel Fuel Sulfur = 0.05%
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	44	0.02	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	44	0.05	
			SO_2	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	44	0.02	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	44	0.02	
			PM_{10}	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	44	0.02	
			$PM_{2.5}$	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	44	0.02	
			CO_2e	163.6	lb/MMBtu	USEPA Data	137.634	44	3.0	
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lb/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EMISSION FACTOR**	**UNITS**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**ACTUAL OPERATING (hpy)**	**ANNUAL EMISSIONS (tpy)**	**COMMENTS**
HPVGTS	HPVGTS-1		VOC			Emission Inventory	3	7,608	10.3	
			CO				58	7,608	219.9	
			CO_2e			emission Inventory/ EPA EF	9800	7,608	37,278.5	
Low Pressure Absorber	BT-603		VOC			Emission Inventory	1	7,608	3.0	
			CO				1	7,608	2.7	
			CO_2e			BP calcs/EPA EF	117	7,608	446.5	
CRU Extraction Drum	BD-625		VOC			Emission Inventory	1.0	7,608	3.8	
CRU Surge Drum	BD-631		VOC			Emission Inventory	4.0	7,608	15.2	
CRU Waste Slurry Drum	BD-632		VOC			Emission Inventory	0.003	7,608	0.01	
Silo Scrubber	BT-501		PM	98	% Removal	Average of data from 12/04 source test	0.84	7,608	3.2	
			PM_{10}	98	% Removal		0.84	7,608	3.2	
			$PM_{2.5}$	98	% Removal		0.84	7,608	3.2	
CRU Evaporator Overhd Condenser	BE-645		VOC			Emission Inventory	0.3	7,608	1.1	
DHT Ovhd Scrubber	BT-702		VOC			Emission Inventory	14.5	59	0.4	Based on hours vent open
			CO				54.7	59	1.6	
			CO_2e			BP calcs/EPA EF	379.5	59	11.2	
Process Fugitives			VOC			USEPA LDAR EF	19.8	7,608	75.4	

TOTAL EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	**PROCESS SOURCES**	**COMBUSTION SOURCES**	**FUGITIVE SOURCES**	**TOTALS**
NOx	0	0.7	N/A	0.7
VOC	62.5	0.004	94.4	156.9
CO	403.0	0.1	N/A	403.0
SO_2	0	0.001	N/A	0.001
PM	6.6	0.01	N/A	6.6
PM_{10}	6.6	0.01	N/A	6.6
$PM_{2.5}$	6.6	0.01	N/A	6.6
CO_2e	42,939.8	30.8	N/A	42,970.6

TOTAL EMISSIONS - #1 OX BASELINE ACTUAL (tpy)				
POLLUTANT	**PROCESS SOURCES**	**COMBUSTION SOURCES**	**FUGITIVE SOURCES**	**TOTALS**
NOx	0	0.2	N/A	0.2
VOC	46.0	0.02	78.7	124.7
CO	275.1	0.04	N/A	275.1
SO_2	0	0.01	N/A	0.01
PM	3.3	0.01	N/A	3.3
PM_{10}	3.3	0.01	N/A	3.3
$PM_{2.5}$	3.3	0.01	N/A	3.4
CO_2e	38,804.2	2.6	N/A	38,806.8

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	**0.5**
VOC	40	**32.2**
CO	100	**127.9**
SO_2	40	**-0.01**
PM	25	**3.2**
PM_{10}	15	**3.2**
$PM_{2.5}$	10	**3.2**
CO_2e	75,000	**4,163.8**

Table B-3
#2 OX PSD Analysis

PTE

			NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)				
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM FIRE RATE**	**POLLUTANT EMITTED**	**AP-42 1.4 FACTOR (lb/MM scf)**	**NATURAL GAS EF (lb/MMBtu)**	**HOURLY EMISSION (lb/hr)**	**PERMIT OPERATE (hpy)**	**ANNUAL EMISSION (tpy)**	**AP-42 FACTOR (lb/hp-hr)**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**PERMIT OPERATE (hpy)***	**Annual Emission (tpy) - Oil**
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	500	6.44
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	500	0.17
			CO						0.0055	AP-42 3.4 (10/96)	5.90	500	1.48
		hp	SO_2						0.00040	AP-42 3.4 (10/96)	0.43	500	0.11
			PM						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			PM_{10}						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			$PM_{2.5}$						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			CO_2e						163.6	lb/MMBtu-USEPA	440.76	500	110.19
HPVGTS Heater	DB-1813	15.0	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
		MMBtu/hr	SO_2	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM_{10}	7.6	0.007	0.11	8,760	0.5					
			$PM_{2.5}$	7.6	0.007	0.11	8,760	0.5					
			CO_2e	----	117.000	1755.00	8,760	7,687.0					

EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lb/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EF (% Removal)**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSION (lb/hr)**	**PERMIT OPERATE (hpy)**	**ANNUAL EMISSION (tpy)**	**COMMENTS**
HPVGTS	DR-1814/ DT-1821	175	VOC**	98%	BP design Calcs	3.5	8,760	15.3	Maximum rate based on BP design calculations. See emissions footnote.
		1500	CO**	95%		75.0	8,760	329.0	
		2300	CO_2e	0	BP calc/USEPA EF	2300	8,760	10,074	
Low Pressure Absorber	DT-302	8.85	VOC**		BP design Calcs	8.9	8,760	38.8	Maximum rate based on BP design calculations. See emissions footnote.
		3.47	CO**			3.5	8,760	15.2	
		231.7	CO_2e		BP calc/USEPA EF	231.7	8,760	1,015	
Intermediate Silo Scrubber	DT-500	10.4	PM	99	BP Calcs	0.10	8,760	0.5	Maximum rate based on hourly emissions and % removal and application for #2 unit (permit CF)
			PM_{10}	99	BP Calcs	0.10	8,760	0.5	
			$PM_{2.5}$	99	BP Calcs	0.10	8,760	0.5	
CRU Extraction Drum	DD-412	CRU removed	VOC						CRU is being removed
CRU Waste Slurry Drum	DD-413		VOC						
CRU Mother Liquor Drum	DD-414		VOC						
CRU Evaporation Drum	DE-416		VOC						
Process Fugitives			VOC		USEPA LDAR EF	5.06	8,760	95.7	

*** Hours of operation of DM-135 based on Title V permit limit.**

**** Emission Revision Comments**

HPVGTS - VOC The hourly emissions have been revised to reflect the new process design which includes changes in the process flow scheme.

HPVGTS - CO The hourly emissions have been revised to reflect the new process design which includes changes in the process flow scheme.

LPA - VOC & CO The hourly emissions rates are revised based on the new flow scheme after the project and improvements to the LPA

Table B-3
#2 OX PSD Analysis

2010 Actuals

			NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)					
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM FIRE RATE**	**POLLUTANT EMITTED**	**AP-42 1.4 FACTOR (lb/MM scf)**	**NATURAL GAS EF (lb/MMBtu)**	**HOURLY EMISSION (lb/hr)**	**ACTUAL OPERATE (hpy)**	**ANNUAL EMISSION (tpy)**	**AP-42 FACTOR (lb/hp-hr)**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**ACTUAL OPERATE (hpy)**	**ANNUAL EMISSION (tpy) - OIL**	
Emergency Generator #3	DM-135	1072.8 hp	NOx						0.024	AP-42 3.4 (10/96)	25.75	61	0.79	
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	61	0.02	
			CO						0.0055	AP-42 3.4 (10/96)	5.90	61	0.18	
			SO_2						0.00040	AP-42 3.4 (10/96)	0.43	61	0.01	
			PM						0.0007	AP-42 3.4 (10/96)	0.75	61	0.02	
			PM_{10}						0.0007	AP-42 3.4 (10/96)	0.75	61	0.02	
			$PM_{2.5}$						0.0007	AP-42 3.4 (10/96)	0.75	61	0.02	
			CO_2e						163.6	lb/MMBtu-USEPA	440.76	61	13.44	
HPVGTS Heater	DB-1813	4.64 MMBtu/hr	NOx	100	0.098	0.45	8,083	1.8						
			VOC	5.5	0.005	0.03	8,083	0.1						
			CO	84	0.082	0.38	8,083	1.5						
			SO_2	0.6	0.001	0.00	8,083	0.01						
			PM	7.6	0.007	0.03	8,083	0.1						
			PM_{10}	7.6	0.007	0.03	8,083	0.1						
			$PM_{2.5}$	7.6	0.007	0.03	8,083	0.1						
			CO_2e	----	117.000	542.50	8,083	2192.5						
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lb/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EF (% Removal)**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSION (lb/hr)**	**ACTUAL OPERATE (hpy)**	**ANNUAL EMISSION (tpy)**	**COMMENTS**					
HPVGTS	DR-1814/ DT-1821		VOC		Emission Inventory	2.56	8,096	10.4						
			CO			18.13	8,096	73.4						
			CO_2e		BP calcs/EPA EF	4707.58	8,096	19056.3						
Low Pressure Absorber	DT-302		VOC		Emission Inventory	4.70	8,096	19.0						
			CO			0.02	8,096	0.1						
			CO_2e		BP calcs/EPA EF	6.25	8,096	25.3						
Intermediate Silo Scrubber	DT-500	10	PM	99	BP Calcs	0.10	8,096	0.4	Maximum rate based on hourly emissions and % removal					
			PM_{10}	99	BP Calcs	0.10	8,096	0.4						
			$PM_{2.5}$	99	BP Calcs	0.10	8,096	0.4						
CRU Extraction Drum	DD-412		VOC		BP Calcs	0.00	8,096	0.02						
CRU Waste Slurry Drum	DD-413		VOC		BP Calcs	0.04	8,096	0.2						
CRU Mother Liquor Drum	DD-414		VOC		BP Calcs	0.04	8,096	0.2						
CRU Evaporation Drum	DE-416		VOC		BP Calcs	1.00	8,096	4.0						
Process Fugitives			VOC		USEPA LDAR EF	20.05	8,096	81.2						

Table B-3
#2 OX PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	NATURE GAS: AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy)	DIESEL FUEL (SULFUR = 0.05%): AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy) - OIL
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	70	0.90
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	70	0.02
			CO						0.0055	AP-42 3.4 (10/96)	5.90	70	0.21
		hp	SO_2						0.00040	AP-42 3.4 (10/96)	0.43	70	0.02
			PM						0.0007	AP-42 3.4 (10/96)	0.75	70	0.03
			PM_{10}						0.0007	AP-42 3.4 (10/96)	0.75	70	0.03
			$PM_{2.5}$						0.0007	AP-42 3.4 (10/96)	0.75	70	0.03
			CO_2e						163.6	lb/MMBtu-USEPA	440.76	70	15.43
HPVGTS Heater	DB-1813	5.57	NOx	100	0.098	0.55	8,374	2.3					
			VOC	5.5	0.005	0.03	8,374	0.1					
			CO	84	0.082	0.46	8,374	1.9					
		MMBtu/hr	SO_2	0.6	0.001	0.00	8,374	0.01					
			PM	7.6	0.007	0.04	8,374	0.2					
			PM_{10}	7.6	0.007	0.04	8,374	0.2					
			$PM_{2.5}$	7.6	0.007	0.04	8,374	0.2					
			CO_2e	----	117.000	651.20	8,374	2726.6					

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	ACTUAL OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS
HPVGTS	DR-1814/ DT-1821		VOC		Emission Inventory	0.29	8,392	1.2	
			CO			15.67	8,392	65.7	
			CO_2e		BP calcs/EPA EF	9036.94	8,392	37,919.0	
Low Pressure Absorber	DT-302		VOC		Emission Inventory	4.45	8,392	18.7	
			CO			0.02	8,392	0.1	
			CO_2e		BP calcs/EPA EF	5.92	8,392	24.8	
Intermediate Silo Scrubber	DT-500	10	PM	99	BP Calcs	0.10	8,392	0.4	Maximum rate based on hourly emissions and % removal
			PM_{10}	99	BP Calcs	0.10	8,392	0.4	
			$PM_{2.5}$	99	BP Calcs	0.10	8,392	0.4	
CRU Extraction Drum	DD-412		VOC		BP Calcs	0.00	8,392	0.02	
CRU Waste Slurry Drum	DD-413		VOC		BP Calcs	0.04	8,392	0.2	
CRU Mother Liquor Drum	DD-414		VOC		BP Calcs	0.04	8,392	0.2	
CRU Evaporation Drum	DE-416		VOC		BP Calcs	1.00	8,392	4.2	
Process Fugitives			VOC		USEPA LDAR EF	20.05	8,392	84.1	

Table B-3
#2 OX PSD Analysis

ANNUAL EMISSIONS - PTE				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	12.9	N/A	12.9
VOC	54.1	0.5	95.7	150.3
CO	344.2	6.9	N/A	351.1
SO_2	0	0.1	N/A	0.1
PM	0.5	0.7	N/A	1.1
PM_{10}	0.5	0.7	N/A	1.1
$PM_{2.5}$	0.5	0.7	N/A	1.1
CO_2e	11,088.8	7797.2	N/A	18,886.0

ANNNUAL EMISSIONS - BASELINE ACTUAL				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	2.9	N/A	2.9
VOC	29.1	0.1	82.7	111.9
CO	69.7	1.9	N/A	71.6
SO_2	0	0.03	N/A	0.03
PM	0.4	0.2	N/A	0.6
PM_{10}	0.4	0.2	N/A	0.6
$PM_{2.5}$	0.4	0.2	N/A	0.6
CO_2e	28512.7	2474.0	N/A	30986.7

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	**10.0**
VOC	40	**38.4**
CO	100	**279.5**
SO_2	40	**0.1**
PM	25	**0.5**
PM_{10}	15	**0.5**
$PM_{2.5}$	10	**0.5**
CO_2e	75,000	**-12100.6**

Table B-4
CR #1 PTA PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Average of data from 2/95 source test	0.10	8,760	0.4	
			PM_{10}	-		0.10	8,760	0.4	
			$PM_{2.5}$	-		0.10	8,760	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2014 Testing	20.00	8,760	87.6	Emissions revised based on 2014 tests
			CO		2014 Testing	24.00	8,760	105.1	
			PM	-	Data from 2004 & recent engineering tests	1.21	8,760	5.3	Emissions from source tests revised to reflect recent process changes
			PM_{10}	-		1.21	8,760	5.3	
			$PM_{2.5}$	-		1.21	8,760	5.3	
Dryer Scrubber	CM-404A	-	PM	-	Average of data from 2/95 source test	0.30	8,760	1.3	
			PM_{10}	-		0.30	8,760	1.3	
			$PM_{2.5}$	-		0.30	8,760	1.3	
Dryer Scrubber	CM-404B		PM	-	Average of data from 2/95 source test	0.30	8,760	1.3	
			PM_{10}	-		0.30	8,760	1.3	
			$PM_{2.5}$	-		0.30	8,760	1.3	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Rotary Lock A Dust Collector	CM-608A	100	PM	0.01	USEPA Handbook	0.01	8,760	0.04	
			PM_{10}	0.01	USEPA Handbook	0.01	8,760	0.04	
			$PM_{2.5}$	0.01	USEPA Handbook	0.01	8,760	0.04	
Rotary Lock B Dust Collector	CM-608B	100	PM	0.01	USEPA Handbook	0.01	8,760	0.04	
			PM_{10}	0.01	USEPA Handbook	0.01	8,760	0.04	
			$PM_{2.5}$	0.01	USEPA Handbook	0.01	8,760	0.04	

Table B-4
CR #1 PTA PSD Analysis

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Average of data from 2/95 source test	0.10	8,135	0.4	
			PM_{10}	-		0.10	8,135	0.4	
			$PM_{2.5}$	-		0.10	8,135	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2/95 Source test	10.62	8,135	43.2	
			PM	-	Average of data from 12/14/04 source test	1.80	8,135	7.3	
			PM_{10}	-		1.80	8,135	7.3	
			$PM_{2.5}$	-		1.80	8,135	7.3	
Dryer Scrubber	CM-404A	-	PM	-	Average of data from 2/95 source test	0.30	8,135	1.2	
			PM_{10}	-		0.30	8,135	1.2	
			$PM_{2.5}$	-		0.30	8,135	1.2	
Dryer Scrubber	CM-404B		PM	-	Average of data from 2/95 source test	0.30	8,135	1.2	
			PM_{10}	-		0.30	8,135	1.2	
			$PM_{2.5}$	-		0.30	8,135	1.2	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	8,135	1.7	
			PM_{10}	0.01	USEPA Handbook	0.42	8,135	1.7	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,135	1.7	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	8,135	1.7	
			PM_{10}	0.01	USEPA Handbook	0.42	8,135	1.7	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,135	1.7	
Rotary Lock A Dust Collector	CM-608A	100	PM	0.01	USEPA Handbook	0.01	8,135	0.03	
			PM_{10}	0.01	USEPA Handbook	0.01	8,135	0.03	
			$PM_{2.5}$	0.01	USEPA Handbook	0.01	8,135	0.03	
Rotary Lock B Dust Collector	CM-608B	100	PM	0.01	USEPA Handbook	0.01	8,135	0.03	
			PM_{10}	0.01	USEPA Handbook	0.01	8,135	0.03	
			$PM_{2.5}$	0.01	USEPA Handbook	0.01	8,135	0.03	

Table B-4
CR #1 PTA PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	ACTUAL OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Average of data from 2/95 source test	0.10	7,194	0.4	
			PM_{10}	-		0.10	7,194	0.4	
			$PM_{2.5}$	-		0.10	7,194	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2/95 Source test	10.62	7,194	38.2	
			PM	-	Average of data from 12/14/04 source test	1.80	7,194	6.5	
			PM_{10}	-		1.80	7,194	6.5	
			$PM_{2.5}$	-		1.80	7,194	6.5	
Dryer Scrubber	CM-404A	-	PM	-	Average of data from 2/95 source test	0.30	7,194	1.1	
			PM_{10}	-		0.30	7,194	1.1	
			$PM_{2.5}$	-		0.30	7,194	1.1	
Dryer Scrubber	CM-404B		PM	-	Average of data from 2/95 source test	0.30	7,194	1.1	
			PM_{10}	-		0.30	7,194	1.1	
			$PM_{2.5}$	-		0.30	7,194	1.1	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	7,194	1.5	
			PM_{10}	0.01	USEPA Handbook	0.42	7,194	1.5	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	7,194	1.5	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	7,194	1.5	
			PM_{10}	0.01	USEPA Handbook	0.42	7,194	1.5	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	7,194	1.5	
Rotary Lock A Dust Collector	CM-608A	100	PM	0.01	USEPA Handbook	0.01	7,194	0.03	
			PM_{10}	0.01	USEPA Handbook	0.01	7,194	0.03	
			$PM_{2.5}$	0.01	USEPA Handbook	0.01	7,194	0.03	
Rotary Lock B Dust Collector	CM-608B	100	PM	0.01	USEPA Handbook	0.01	7,194	0.03	
			PM_{10}	0.01	USEPA Handbook	0.01	7,194	0.03	
			$PM_{2.5}$	0.01	USEPA Handbook	0.01	7,194	0.03	

Table B-4
CR #1 PTA PSD Analysis

ANNUAL EMISSIONS - PTE			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	87.6	NA	87.6
CO	105.1	NA	105.1
SO_2	0	NA	0
PM	12.1	NA	12.14
PM_{10}	12.1	NA	12.14
$PM_{2.5}$	12.1	NA	12.14

ANNUAL EMISSIONS - BASELINE ACTUAL			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	40.7	NA	40.7
CO	0	NA	0
SO_2	0	NA	0
PM_9	12.9	NA	12.9
PM_{10}	12.9	NA	12.9
$PM_{2.5}$	12.9	NA	12.9

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	**0**
VOC	40	**46.9**
CO	100	**105.1**
SO_2	40	**0**
PM	25	**-0.8**
PM_{10}	15	**-0.8**
$PM_{2.5}$	10	**-0.8**

Table B-5
CR #2 PTA PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	BP Calcs based on 2/95 test of CD101	0.04	8,760	0.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99		0.04	8,760	0.2	
			$PM_{2.5}$	99		0.04	8,760	0.2	
Crystallizer Vent Scrubber	DM-601	54	PM	99	Data from 2004 & recent engineering test	0.54	8,760	2.4	Maximum PM rates based on hourly emissions and % removal. CO & VOC emissions revised based on 2014 tests
			PM_{10}	99		0.54	8,760	2.4	
			$PM_{2.5}$	99		0.54	8,760	2.4	
		6.5	CO	0	2014 Testing	20.00	8,760	87.6	
		20	VOC	0	2014 Testing	20.00	8,760	87.6	
Dryer Scrubber	DM-704	5.2	PM	95	BP design calcs based on #1 PTA Scrubber	0.26	8,760	1.1	Maximum rate based on hourly emissions and % removal
			PM_{10}	95		0.26	8,760	1.1	
			$PM_{2.5}$	95		0.26	8,760	1.1	
Day Silo Dust Collector	DM-797A	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9		0.27	8,760	1.2	
			$PM_{2.5}$	99.9		0.27	8,760	1.2	
Day Silo Dust Collector	DM-797B	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9		0.27	8,760	1.2	
			$PM_{2.5}$	99.9		0.27	8,760	1.2	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	8,760	0.004	
			PM_{10}		BP Calcs	0.001	8,760	0.004	
			$PM_{2.5}$		BP Calcs	0.001	8,760	0.004	

Table B-5
CR #2 PTA PSD Analysis

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	BP Calcs based on 2/95 test of CD101	0.04	8,760	0.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99		0.04	8,760	0.2	
			$PM_{2.5}$	99		0.04	8,760	0.2	
Crystallizer Vent Scrubber	DM-601	54	PM	99	BP Calcs & source test of 4/98 & 12/04	0.54	8,760	2.4	Maximum PM rates based on hourly emissions and % removal
			PM_{10}	99		0.54	8,760	2.4	
			$PM_{2.5}$	99		0.54	8,760	2.4	
		10.6	VOC	0	Source Test	10.62	8,760	46.5	
Dryer Scrubber	DM-704	5.2	PM	95	BP design calcs based on #1 PTA Scrubber	0.26	8,760	1.1	Maximum rate based on hourly emissions and % removal
			PM_{10}	95		0.26	8,760	1.1	
			$PM_{2.5}$	95		0.26	8,760	1.1	
Day Silo Dust Collector	DM-797A	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9		0.27	8,760	1.2	
			$PM_{2.5}$	99.9		0.27	8,760	1.2	
Day Silo Dust Collector	DM-797B	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9		0.27	8,760	1.2	
			$PM_{2.5}$	99.9		0.27	8,760	1.2	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	8,760	0.004	
			PM_{10}		BP Calcs	0.001	8,760	0.004	
			$PM_{2.5}$		BP Calcs	0.001	8,760	0.004	

Table B-5
CR #2 PTA PSD Analysis

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	BP Calcs based on 2/95 test of CD101	0.04	7,043	0.1	Maximum rate based on hourly emissions and % removal
			PM_{10}	99		0.04	7,043	0.1	
			$PM_{2.5}$	99		0.04	7,043	0.1	
Crystallizer Vent Scrubber	DM-601	54	PM	99	BP Calcs & source test of 4/98 & 12/04	0.54	7,043	1.9	Maximum PM rates based on hourly emissions and % removal
			PM_{10}	99		0.54	7,043	1.9	
			$PM_{2.5}$	99		0.54	7,043	1.9	
		10.6	VOC	0	Source Test	10.62	7,043	37.4	
Dryer Scrubber	DM-704	5.2	PM	95	BP design calcs based on #1 PTA Scrubber	0.26	7,043	0.9	Maximum rate based on hourly emissions and % removal
			PM_{10}	95		0.26	7,043	0.9	
			$PM_{2.5}$	95		0.26	7,043	0.9	
Day Silo Dust Collector	DM-797A	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	7,043	0.9	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9		0.27	7,043	0.9	
			$PM_{2.5}$	99.9		0.27	7,043	0.9	
Day Silo Dust Collector	DM-797B	265	PM	99.9	BP design calcs based on #1 PTA Silo	0.27	7,043	0.9	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9		0.27	7,043	0.9	
			$PM_{2.5}$	99.9		0.27	7,043	0.9	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	7,043	0.004	
			PM_{10}		BP Calcs	0.001	7,043	0.004	
			$PM_{2.5}$		BP Calcs	0.001	7,043	0.004	

Table B-5
CR #2 PTA PSD Analysis

ANNUAL EMISSIONS - PTE			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	87.6	NA	87.6
CO	87.6	NA	87.6
SO_2	0	NA	0
PM	6.0	NA	6.0
PM_{10}	6.0	NA	6.0
$PM_{2.5}$	6.0	NA	6.0

ANNUAL EMISSIONS - BASELINE ACTUAL			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	42.0	NA	42.0
CO	0	NA	0
SO_2	0	NA	0
PM	5.4	NA	5.4
PM_{10}	5.4	NA	5.4
$PM_{2.5}$	5.4	NA	5.4

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	**0**
VOC	40	**45.6**
CO	100	**87.6**
SO_2	40	**0**
PM	25	**0.6**
PM_{10}	15	**0.6**
$PM_{2.5}$	10	**0.6**

Table B-6
Cooling Towers PSD Analysis

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	97000	PM	97	Table B-30	0.44	8,760	1.9	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.32	8,760	1.4	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.004	Reisman, Frisbie, 2002
Cooling Tower	AT-202	97000	PM	97	Table B-30	0.44	8,760	1.9	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.32	8,760	1.4	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.004	Reisman, Frisbie, 2002

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002

ANNUAL EMISSIONS - PTE			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO_2	0	NA	0
PM	3.8	NA	3.8
PM_{10}	2.8	NA	2.8
$PM_{2.5}$	0.01	NA	0.01

ANNUAL EMISSIONS - BASELINE ACTUAL			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO_2	0	NA	0
PM	2.7	NA	2.7
PM_{10}	1.9	NA	1.9
$PM_{2.5}$	0.01	NA	0.01

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
NOx	40	**0**
VOC	40	**0**
CO	100	**0**
SO_2	40	**0**
PM	25	**1.1**
PM_{10}	15	**0.8**
$PM_{2.5}$	10	**0.003**

Table B-7
Fugitive Emissions

Post-Project (After BACT)

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item: (NSPS)	0.00347	0.00434	0.00270	0.01360	0.08942	0.01360	0.01360			
EF, lb/hr/item: (HON)	0.00107	0.00105	0.00028	0.01097	0.02751	0.01097	0.01097			
#1 OX Unit (HON)	218	0	398	4	3	1	0	1266.82	4223	2.11
#1 OX (NSPS as HON)*	2023	85	4215	34	17	18	5	494.73	39676	19.84
#2 OX (HON)	244	0	534	3	4	1	0	1485.18	4949	2.47
#2 OX (NSPS as HON)*	1960	202	4325	37	13	15	4	491.14	39388	19.69
OSBL (HON)	303	1	588	6	4	0	0	5834.33	5834	2.92
Total	4748.10	288.11	10060.10	84.02	41.12	35.02	9.02	9,572	94,070	**47.04**

Project LDAR Impact 10.00%

*NSPS as HON means that components subject to NSPS are using the HON LDAR program to monitor.

	USEPA Factor		**EF**	**Effectiveness Factor**	
Factors	**kg/hr**	**lb/kg**	**lb/hr**	**HON**	**NSPS**
Valves, Liquid	0.00403	2.204623	0.00888	0.88	0.61
Valves, Gas	0.00597	2.204623	0.01316	0.92	0.67
Flanges , Drains, Vents, Other	0.00183	2.204623	0.00403	0.93	0.33
Pumps	0.01990	2.204623	0.04387	0.75	0.69
Relief Valves	0.10400	2.204623	0.22928	0.88	0.61
Agitators	0.01990	2.204623	0.04387	0.75	0.69
Compressors	0.01990	2.204623	0.04387	0.75	0.69
Sample Connection	0.01500	2.204623	0.03307	0.93	0.33

USEPA Factor is based on table 2-1 from USEPA Report of 1995 on LDAR Emission factors - Average Emission Factors

Effectiveness factors - HON are based on Table 5-2 from 1995 USEPA Report, NSPS from EIIP Volume II, Table 4.2.2 on page 4.2-10

Pre-Project

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item: (NSPS)	0.00347	0.00434	0.00270	0.01360	0.08942	0.01360	0.01360			
EF, lb/hr/item: (HON)	0.00107	0.00105	0.00028	0.01097	0.02751	0.01097	0.01097			
#1 OX Unit (HON)	198	0	362	4	3	1	0	1184.47	3948	1.97
#1 OX (NSPS)	1839	77	3832	34	17	18	5	2114.70	169595	84.80
#2 OX (HON)	222	0	485	3	4	1	0	1386.95	4622	2.31
#2 OX (NSPS)	1782	184	3932	37	13	15	4	2132.86	171052	85.53
OSBL (HON)	303	1	588	6	4	0	0	5834.33	5834	2.92
Total	4344.00	262.01	9199.00	84.02	41.12	35.02	9.02	12,653	355,051	**177.53**

Table B-8
Tank Farm (Unmodified/Debottlecked)

PTE

EQUIPMENT DESCRIPTION	EQUIPMENT ID NO.	STACK ID NO.	QUANTITY (gallons)	STANDING LOSS (lb/yr)	WORKING LOSS (lb/yr)	TOTAL LOSS/ EMISSIONS (lb/yr)	ANNUAL TOTAL (tpy)
Paraxylene Tank	AF- 101	TK-1	108,974,400	694.89	172.20	867.09	0.43
	AF- 102	TK-2	108,974,400	694.89	172.20	867.09	0.43
	AF- 103	TK-3	108,974,400	694.89	172.20	867.09	0.43
OSBL Fugitives			----	----	----	5,834.33	2.92
TOTALS			326,923,200	2,084.67	516.60	**8,435.60**	**4.22**

2010 Actuals

EQUIPMENT DESCRIPTION	EQUIPMENT ID NO.	STACK ID NO.	QUANTITY (gallons)	STANDING LOSS (lb/yr)	WORKING LOSS (lb/yr)	TOTAL LOSS/ EMISSIONS (lb/yr)	ANNUAL TOTAL (tpy)
Paraxylene Tank	AF- 101	TK-1	78,733,394	694.89	124.41	819.30	0.41
	AF- 102	TK-2	78,733,394	694.89	124.41	819.30	0.41
	AF- 103	TK-3	78,733,394	694.89	124.41	819.30	0.41
OSBL Fugitives			----	----	----	5,834.33	2.92
TOTALS			236,200,182	2,084.67	373.23	**8,292.23**	**4.15**

2011 Actuals

EQUIPMENT DESCRIPTION	EQUIPMENT ID NO.	STACK ID NO.	QUANTITY (gallons)	STANDING LOSS (lb/yr)	WORKING LOSS (lb/yr)	TOTAL LOSS/ EMISSIONS (lb/yr)	ANNUAL TOTAL (tpy)
Paraxylene Tank	AF- 101	TK-1	73,912,058	694.89	116.79	811.68	0.41
	AF- 102	TK-2	73,912,058	694.89	116.79	811.68	0.41
	AF- 103	TK-3	73,912,058	694.89	116.79	811.68	0.41
OSBL Fugitives			----	----	----	5,834.33	2.92
TOTALS			221,736,174	2,084.67	350.37	**8,269.37**	**4.13**

	PTE	**Actuals**	**Delta**
VOC	4.22	4.14	0.08

Table B-9
CR Shipping (Unmodified/Debottlenecked)

PTE

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	PTE EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Average of 06/11/02 source test	0.48	8,760	2.10	
				PM_{10}	-		0.48	8,760	2.10	
				$PM_{2.5}$	-		0.48	8,760	2.10	
Loading Spout A Dust Collector	CP-705A	SL-7	1,200	PM	0.01	USEPA Book	0.10	8,760	0.45	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Book	0.10	8,760	0.45	
				$PM_{2.5}$	0.01	USEPA Book	0.10	8,760	0.45	
Loading Spout B Dust Collcetor	CP-705B	SL-8	1,200	PM	0.01	USEPA Book	0.10	8,760	0.45	
				PM_{10}	0.01	USEPA Book	0.10	8,760	0.45	
				$PM_{2.5}$	0.01	USEPA Book	0.10	8,760	0.45	
Loading Spout C Dust Collector	CP-705C	SL-9	1,200	PM	0.01	USEPA Book	0.10	8,760	0.45	
				PM_{10}	0.01	USEPA Book	0.10	8,760	0.45	
				$PM_{2.5}$	0.01	USEPA Book	0.10	8,760	0.45	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	8,760	0.88	
				PM_{10}	-	BP Calcs	0.20	8,760	0.88	
				$PM_{2.5}$	-	BP Calcs	0.20	8,760	0.88	

Table B-9
CR Shipping (Unmodified/Debottlenecked)

2010 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	PTE EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Based on 06/11/02 source test	0.48	8,760	2.10	
				PM_{10}	-		0.48	8,760	2.10	
				$PM_{2.5}$	-		0.48	8,760	2.10	
Loading Spout A Dust Collector	CP-705A	SL-7	1,200	PM	0.01	USEPA Book	0.10	5,200	0.27	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Book	0.10	5,200	0.27	
				$PM_{2.5}$	0.01	USEPA Book	0.10	5,200	0.27	
Loading Spout B Dust Collcetor	CP-705B	SL-8	1,200	PM	0.01	USEPA Book	0.10	5,200	0.27	
				PM_{10}	0.01	USEPA Book	0.10	5,200	0.27	
				$PM_{2.5}$	0.01	USEPA Book	0.10	5,200	0.27	
Loading Spout C Dust Collector	CP-705C	SL-9	1,200	PM	0.01	USEPA Book	0.10	5,200	0.27	
				PM_{10}	0.01	USEPA Book	0.10	5,200	0.27	
				$PM_{2.5}$	0.01	USEPA Book	0.10	5,200	0.27	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	5,200	0.52	
				PM_{10}	-	BP Calcs	0.20	5,200	0.52	
				$PM_{2.5}$	-	BP Calcs	0.20	5,200	0.52	

Table B-9
CR Shipping (Unmodified/Debottlenecked)

2011 Actuals

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	PTE EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Book	0.42	8,760	1.86	
				PM_{10}	0.01	USEPA Book	0.42	8,760	1.86	
				$PM_{2.5}$	0.01	USEPA Book	0.42	8,760	1.86	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Based on 06/11/02 source test	0.48	8,760	2.10	
				PM_{10}	-		0.48	8,760	2.10	
				$PM_{2.5}$	-		0.48	8,760	2.10	
Loading Spout A Dust Collector	CP-705A	SL-7	1,200	PM	0.01	USEPA Book	0.10	3,500	0.18	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Book	0.10	3,500	0.18	
				$PM_{2.5}$	0.01	USEPA Book	0.10	3,500	0.18	
Loading Spout B Dust Collcetor	CP-705B	SL-8	1,200	PM	0.01	USEPA Book	0.10	3,500	0.18	
				PM_{10}	0.01	USEPA Book	0.10	3,500	0.18	
				$PM_{2.5}$	0.01	USEPA Book	0.10	3,500	0.18	
Loading Spout C Dust Collector	CP-705C	SL-9	1,200	PM	0.01	USEPA Book	0.10	3,500	0.18	
				PM_{10}	0.01	USEPA Book	0.10	3,500	0.18	
				$PM_{2.5}$	0.01	USEPA Book	0.10	3,500	0.18	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	3,500	0.35	
				PM_{10}	-	BP Calcs	0.20	3,500	0.35	
				$PM_{2.5}$	-	BP Calcs	0.20	3,500	0.35	

SHIPPING AND LOADING PTE EMISSIONS		
POLLUTANT	PROCESS SOURCES (tpy)	TOTALS
PM	9.91	9.91
PM_{10}	9.91	9.91
$PM_{2.5}$	9.91	9.91

S&L BASELINE ACTUAL EMISSIONS		
POLLUTANT	PROCESS SOURCES (tpy)	TOTALS
PM	8.78	8.78
PM_{10}	8.78	8.78
$PM_{2.5}$	8.78	8.78

POLLUTANT	THRESHOLD	DELTA (PTE - ACTUAL)
PM	25	**1.12**
PM_{10}	15	**1.12**
$PM_{2.5}$	10	**1.12**

Table B-10
Incremental Boiler Steam Production

Emission Equipment	Boiler 3 or 4
Equipment ID Number	350 - A or B
Stack ID No.	U-10 or 11

	NATURAL GAS							
MAXIMUM FIRE RATE	**POLLUTANT EMITTED**	**AP-42 EF (lb/MMscf)**	**NG EF (lb/MMBtu)**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**OPERATE (hrs/yr)**	**ANNUAL EMISSION (tpy)**	**COMMENTS**
49.30	NOx	---	0.0800	**Vendor Data**	3.944	8,760	17.28	*Boiler has firm gas and only burns oil in force majeur.
	VOC	5.5	0.0054	AP-42 1.4 (7/98)	0.266	8,760	1.16	
	CO	84	0.0824	AP-42 1.4 (7/98)	4.060	8,760	17.78	
MMBtu/hr	SO_2	0.6	0.0006	AP-42 1.4 (7/98)	0.029	8,760	0.13	
	PM	5.1	0.0050	**Vendor Data**	0.247	8,760	1.08	
	PM_{10}	5.1	0.0050	**Vendor Data**	0.247	8,760	1.08	
	$PM_{2.5}$	5.1	0.0050	**Vendor Data**	0.247	8,760	1.08	
	CO_2e	---	117	USEPA Data	5,768.26	8,760	25,265	

INCREMENTAL STEAM PRODUCTION			
POLLUTANT	**PROCESS SOURCES (tpy)**	**COMBUSTION SOURCES (tpy)**	**TOTALS (tpy)**
NOx	N/A	17.28	17.28
VOC	N/A	1.16	1.16
CO	N/A	17.78	17.78
SO_2	N/A	0.13	0.13
PM	N/A	1.08	1.08
PM_{10}	N/A	1.08	1.08
$PM_{2.5}$	N/A	1.08	1.08
CO_2e	N/A	25,264.98	25,265

Incremental Process Steam Usage	**40**	M lbs/hr
Incremental Turbine Steam Usage	**0.41**	
Incremental Fuel Burned	1220.00	Btu/lb of steam
Fuel	**49.30**	MMBtu/hr

Assume fuel is gas since asked to be gas boiler for MACT

Table B-11
Post-Project Facility-Wide Controlled Emissions

Controlled Emissions - Modified Units (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	TANK FARM	COOLING TOWER	TOTAL
NOx	0.7	12.9	0	0	0	0	13.6
VOC	156.9	150.3	87.6	87.6	4.2	0	486.7
CO	403.0	351.1	105	88	0	0	946.8
SO_2	0.00	0.1	0	0	0	0	0.1
PM	6.6	1.1	12.1	6.0	0	3.8	29.7
PM_{10}	6.6	1.1	12.1	6.0	0	2.8	28.6
$PM_{2.5}$	6.6	1.1	12.1	6.0	0	0.01	25.9
CO_2e	42,971	18,886	0	0	0	0	61,857

Controlled Emissions - Unmodified Units (tpy)

POLLUTANTS	SHIP & LOAD	UTILITY	WWT	TOTAL
NOx	0	311.2	0	311.2
VOC	0	21.2	69	89.8
CO	0	286.1	0	286.1
SO_2	0	188.9	0	188.9
PM	13.6	33.8	0	47.4
PM_{10}	13.6	30.7	0	44.3
$PM_{2.5}$	13.6	28.4	0	42.0
CO_2e	0	418,175	0	418,174.8

Facility-Wide - Post Project (tpy)

POLLUTANTS	MODIFIED UNITS	UNMODIFIED UNITS	FACILITY-WIDE TOTAL
NOx	13.6	311.2	324.9
VOC	486.7	89.8	576.5
CO	946.8	286.1	1233.0
SO_2	0.1	188.9	189.0
PM	29.7	47.4	77.1
PM_{10}	28.6	44.3	73.0
$PM_{2.5}$	25.9	42.0	67.9
CO_2e	61,857	418,175	480,031

Uncontrolled Emissions

Table B-12

Facility Uncontrolled Pre- and Post-Project PTE EmissionsSummary

Modified Units Post-Project Uncontrolled Emissions (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	TANK FARM	COOLING TOWER	TOTAL
NOx	65.2	119.2	0	0	0	0	184.5
VOC	1,272.9	1,020.5	87.6	87.6	28.7	0	2,497.4
CO	7,723.8	6,617.9	105	88	0	0	14,534.4
SO_2	0.1	1.9	0	0	0	0	2.0
PM	7.1	49.2	1,215.8	2598.7	0	127.6	3,998.2
PM_{10}	7.1	49.2	1,215.8	2598.7	0	92.6	3,963.3
$PM_{2.5}$	7.1	49.2	1,215.8	2598.7	0	0.3	3,871.0
CO_2e	45,637	20,706	0	0	0	0	66,344

Modified Units Pre-Project Uncontrolled Emissions (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	TANK FARM	COOLING TOWER	TOTAL
NOx	100.1	119.2	0	0	0	0	219.3
VOC	1,329.7	1,008.8	30.7	30.7	28.7	0.0	2,428.5
CO	10,222.6	6,616.9	0	0	0	0	16,839.5
SO_2	6.6	1.9	0	0	0	0	8.6
PM	13.7	49.2	1,474.2	2,598.7	0	89.4	4,225.1
PM_{10}	13.7	49.2	1,474.2	2,598.7	0	64.9	4,200.6
$PM_{2.5}$	13.7	49.2	1,474.2	2,598.7	0	0.2	4,135.9
CO_2e	49,315	20,706	0	0	0	0	70,021

	Uncontrolled Facility-Wide Totals - Post-Project			**Uncontrolled Facility-Wide Totals - Pre-Project**		
POLLUTANTS	MODIFIED	UNMODIFIED	TOTAL	PRE	UNMODIFIED	TOTAL
NOx	184.5	311.2	495.7	219.3	311.2	530.5
VOC	2,497.4	89.8	2,587.2	2,428.5	89.8	2,518.4
CO	14,534.4	286.1	14,820.5	16,839.5	286.1	17,125.6
SO_2	2.0	188.9	190.9	8.6	188.9	197.5
PM	3,998.2	1,396.0	5,394.2	4,225.1	1,396.0	5,621.1
PM_{10}	3,963.3	1,392.9	5,356.2	4,200.6	1,392.9	5,593.6
$PM_{2.5}$	3,871.0	1,390.7	5,261.6	4,135.9	1,390.7	5,526.6
CO_2e	66,344	418,175	484,519	70,021.2	418,175	488,196

Table B-13
CR #1 OX Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Post-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	OPERATING HOURS (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	762	NOx	0.00769	lb/hp-hr	Manufacturer Data	5.86	8,760	25.7	Diesel Fuel Sulfur = 15 ppm
			VOC	0.00009	lb/hp-hr	Manufacturer Data	0.07	8,760	0.3	
			CO	0.00077	lb/hp-hr	Manufacturer Data	0.59	8,760	2.6	
			SO_2	0.00001	lb/hp-hr	Manufacturer Data	0.01	8,760	0.04	
			PM	0.00007	lb/hp-hr	Manufacturer Data	0.06	8,760	0.3	
			PM_{10}	0.00007	lb/hp-hr	Manufacturer Data	0.06	8,760	0.3	
			$PM_{2.5}$	0.00007	lb/hp-hr	Manufacturer Data	0.06	8,760	0.3	
			CO_2e	163.6	lb/MMBtu	USEPA Data	313.067	8760	1371.2	
Emergency Generator #4	BM-1204	737	NOx	0.01226	lb/hp-hr	Manufacturer Data	9.03	8,760	39.6	Diesel Fuel Sulfur = 15 ppm
			VOC	0.00002	lb/hp-hr	Manufacturer Data	0.02	8,760	0.1	
			CO	0.00077	lb/hp-hr	Manufacturer Data	0.57	8,760	2.5	
			SO_2	0.00001	lb/hp-hr	Manufacturer Data	0.01	8,760	0.04	
			PM	0.00007	lb/hp-hr	Manufacturer Data	0.05	8,760	0.2	
			PM_{10}	0.00007	lb/hp-hr	Manufacturer Data	0.05	8,760	0.2	
			$PM_{2.5}$	0.00007	lb/hp-hr	Manufacturer Data	0.05	8,760	0.2	
			CO_2e	163.6	lb/MMBtu	USEPA Data	302.795	8760	1326.2	
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lbs/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EMISSION FACTOR**	**UNITS**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**OPERATING HOURS (hpy)**	**ANNUAL EMISSIONS (tpy)**	**COMMENTS**
HPVGTS	HPVGTS-1	234	VOC	0.0	% Removal	Based on controlled & efficiency	234.00	8,760	1024.9	**Assume 0 Removal for control device**
		1758	CO	0.0	% Removal		1758.00	8,760	7700.7	
		9510.6	CO_2e	0	% Removal		9510.6	8,760	41700.0	
Low Pressure Absorber	BT-603	9.6	VOC			Recovery device so based on controlled emissions	9.6	8,760	42.0	Recovery Device
		4.1	CO				4.1	8,760	18.0	
		283.0	CO_2e				283.0	8,760	1239.9	
CRU Extraction Drum	BD-625	**CRU removed**	VOC							CRU is being removed
CRU Surge Drum	BD-631		VOC							
CRU Waste Slurry Drum	BD-632		VOC							
Silo Scrubber	BT-501		PM	0	% Removal	Based on controlled & efficiency	1.50	8,760	6.6	**Assume 0 Removal for control device**
			PM_{10}	0.0	% Removal		1.50	8,760	6.6	
			$PM_{2.5}$	0	% Removal		1.50	8,760	6.6	
CRU Evaporator Overhd Condenser	BE-645	**CRU removed**	VOC							CRU being removed
DHT Ovhd Scrubber	BT-702	**Vent Removed**	VOC							Vent Removed
			CO							
			CO_2e							
Process Fugitives			VOC			USEPA LDAR EF	46.9	8,760	205.6	**No LDAR program**

Table B-13

CR #1 OX Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Pre-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	UNCONTROLLED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	22.847	8,760	100.1	Diesel Fuel Sulfur = 0.05%,
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	1.853	8,760	8.1	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	4.923	8,760	21.6	
			SO_2	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	1.511	8,760	6.6	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	1.621	8,760	7.1	
			PM_{10}	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	1.621	8,760	7.1	
			$PM_{2.5}$	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	1.621	8,760	7.1	
			CO_2e	163.6	lb/MMBtu	USEPA Data	137.634	8,760	602.8	
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lbs/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EMISSION FACTOR**	**UNITS**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSIONS (lb/hr)**	**OPERATING HOURS (hpy)**	**ANNUAL EMISSIONS (tpy)**	**COMMENTS**
HPVGTS	HPVGTS-1	131	VOC	0.0	% Removal	Based on controlled & efficiency	131.00	8,760	573.8	**Assume 0 Removal for control device**
		2233	CO	0.0	% Removal		2233.00	8,760	9781.2	
		10000.0	CO_2e	0	% Removal		10000.0	8,760	43843.6	
Low Pressure Absorber	BT-603	20	VOC			Recovery device so based on controlled emissions	20.00	8,760	87.6	Recovery Device
		9.0	CO				9.00	8,760	39.8	
		400.0	CO_2e				400.0	8,760	1752.4	
CRU Extraction Drum	BD-625		VOC			BP Calcs	1.0	8,760	4.4	CRU is being removed
CRU Surge Drum	BD-631		VOC			BP Calcs	4.0	8,760	17.5	
CRU Waste Slurry Drum	BD-632		VOC			BP Calcs	0.003	8,760	0.01	
Silo Scrubber	BT-501		PM	0	% Removal	Based on controlled & efficiency	1.50	8,760	6.6	**Assume 0 Removal for control device**
			PM_{10}	0.0	% Removal		1.50	8,760	6.6	
			$PM_{2.5}$	0	% Removal		1.50	8,760	6.6	
CRU Evaporator Overhd Condenser	BE-645	**CRU removed**	VOC				0.3	8,760	1.3	CRU being removed
DHT Ovhd Scrubber	BT-702	**Vent Removed**	VOC				60.0	8,760	262.8	Vent Removed
			CO				87.0	8,760	380.0	
			CO_2e				711.4	8,760	3115.9	
Process Fugitives			VOC			USEPA LDAR EF	42.7	8,760	187.1	**No LDAR program**

TOTAL POST PROJECT EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	**PROCESS SOURCES**	**COMBUSTION SOURCES**	**FUGITIVE SOURCES**	**TOTALS**
NOx	0.0	65.2	N/A	65.2
VOC	1067.0	0.4	205.6	1272.9
CO	7718.7	5.1	N/A	7723.8
SO_2	0.0	0.1	N/A	0.1
PM	6.6	0.5	N/A	7.1
PM_{10}	6.6	0.5	N/A	7.1
$PM_{2.5}$	6.6	0.5	N/A	7.1
CO_2e	42,940.0	2697.5	N/A	45,637.4

TOTAL PRE PROJECT EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	**PROCESS SOURCES**	**COMBUSTION SOURCES**	**FUGITIVE SOURCES**	**TOTALS**
NOx	0.0	100.1	N/A	100.1
VOC	1134.5	8.1	187.1	1329.7
CO	10201.1	21.6	N/A	10222.6
SO_2	0.0	6.6	N/A	6.6
PM	6.6	7.1	N/A	13.7
PM_{10}	6.6	7.1	N/A	13.7
$PM_{2.5}$	6.6	7.1	N/A	13.7
CO_2e	48,711.9	602.8	N/A	49,314.8

Table B-14
#2 OX Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Post-Project

			NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)				
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy) - Oil
Emergency Generator #3	DM-135	1072.8	NOx						0.024	AP-42 3.4 (10/96)	25.75	8,760	112.77
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	8,760	3.01
			CO						0.0055	AP-42 3.4 (10/96)	5.90	8,760	25.84
		hp	SO_2						0.00040	AP-42 3.4 (10/96)	0.43	8,760	1.90
			PM						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			PM_{10}						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			$PM_{2.5}$						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			CO_2e						163.6	lb/MMBtu-USEPA	440.76	8,760	1930.52
HPVGTS Heater	DB-1813	15.0	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
		MMBtu/hr	SO_2	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM_{10}	7.6	0.007	0.11	8,760	0.5					
			$PM_{2.5}$	7.6	0.007	0.11	8,760	0.5					
			CO_2e	----	117.000	1,755.00	8,760	7,687.0					
EMISSION EQUIPMENT DESCRIPTION	**EQUIPMENT ID NUMBER**	**MAXIMUM RATE (lb/hr)**	**POLLUTANT EMITTED**	**POLLUTANT EF (% Removal)**	**EMISSION FACTOR REFERENCE**	**HOURLY EMISSION (lb/hr)**	**PERMIT OPERATE (hpy)**	**ANNUAL EMISSION (tpy)**	**COMMENTS**				
HPVGTS	DR-1814/ DT-1821	175	VOC	0%	Based on controlled & efficiency	175.00	8,760	766.5	Assume 0 Removal for control devic				
		1500	CO	0%		1,500.2	8,760	6,571.5					
		2300	CO_2e	0		2,300	8,760	10,074.0					
Low Pressure Absorber	DT-302	8.9	VOC		Recovery device so based on controlled emissions	8.85	8,760	38.8	Recovery Device				
		3.5	CO			3.47	8,760	15.2					
		231.7	CO_2e			231.7	8,760	1,014.9					
Intermediate Silo Scrubber	DT-500	10.4	PM	0	Based on controlled & efficiency	10.37	8,760	45.4	Assume 0 Removal for control devic				
			PM_{10}	0		10.37	8,760	45.4					
			$PM_{2.5}$	0		10.37	8,760	45.4					
CRU Extraction Drum	DD-412	CRU removed	VOC						CRU is being removed				
CRU Waste Slurry Drum	DD-413		VOC										
CRU Mother Liquor Drum	DD-414		VOC										
CRU Evaporation Drum	DE-416		VOC										
Process Fugitives			VOC		USEPA LDAR EF	48.38	8,760	211.9	Assumes No LDAR program				

Table B-14
#2 OX Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Pre-Project

			NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)				
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	UNCONTROL OPERATE (hpy)	ANNUAL EMISSION (tpy) - Oil
Emergency Generator #3	DM-135	1072.8 hp	NOx						0.024	AP-42 3.4 (10/96)	25.75	8,760	112.77
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	8,760	3.01
			CO						0.0055	AP-42 3.4 (10/96)	5.90	8,760	25.84
			SO_2						0.00040	AP-42 3.4 (10/96)	0.43	8,760	1.90
			PM						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			PM_{10}						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			$PM_{2.5}$						0.0007	AP-42 3.4 (10/96)	0.75	8,760	3.29
			CO_2e						163.6	lb/MMBtu-USEPA	440.76	8,760	1930.52
HPVGTS Heater	DB-1813	15.0 MMBtu/hr	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
			SO_2	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM_{10}	7.6	0.007	0.11	8,760	0.5					
			$PM_{2.5}$	7.6	0.007	0.11	8,760	0.5					
			CO_2e	----	117.000	1,755.00	8,760	7,687.0					
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS				
HPVGTS	DR-1814/ DT-1821	175	VOC	0%	Based on controlled & efficiency	175.0	8,760	766.5	Assume 0 Removal for control devic				
		1500	CO	0%		1,500.0	8,760	6,570.4					
		2300	CO_2e	0		2,300	8,760	10,074.0					
Low Pressure Absorber	DT-302	8.9	VOC		Recovery device so based on controlled emissions	8.85	8,760	38.8	Recovery Device				
		3.5	CO			3.47	8,760	15.2					
		231.7	CO_2e			231.7	8,760	1,014.9					
Intermediate Silo Scrubber	DT-500	10.4	PM	0	Based on controlled & efficiency	10.37	8,760	45.4	Assume 0 Removal for control devic				
			PM_{10}	0		10.37	8,760	45.4					
			$PM_{2.5}$	0		10.37	8,760	45.4					
CRU Extraction Drum	DD-412	CRU removed	VOC			0.01	8,760	0.02	CRU is being removed				
CRU Waste Slurry Drum	DD-413		VOC			0.04	8,760	0.2					
CRU Mother Liquor Drum	DD-414		VOC			0.04	8,760	0.2					
CRU Evaporation Drum	DE-416		VOC			1.04	8,760	4.5					
Process Fugitives			VOC		USEPA LDAR EF	44.58	8,760	195.2	Assumes No LDAR program				

TOTAL POST-PROJECT EMISSIONS - #2 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	119.2	N/A	119.2
VOC	805.3	3.4	211.9	1,020.5
CO	6,586.7	31.3	N/A	6,617.9
SO_2	0	1.9	N/A	1.9
PM	45.4	3.8	N/A	49.2
PM_{10}	45.4	3.8	N/A	49.2
$PM_{2.5}$	45.4	3.8	N/A	49.2
CO_2e	11,088.9	9,617.5	N/A	20,706.5

TOTAL PRE-PROJECT EMISSIONS - #2 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	119.2	N/A	119.2
VOC	810.2	3.4	195.2	1,008.8
CO	6,585.6	31.3	N/A	6,616.9
SO_2	0	1.9	N/A	1.9
PM	45.4	3.8	N/A	49.2
PM_{10}	45.4	3.8	N/A	49.2
$PM_{2.5}$	45.4	3.8	N/A	49.2
CO_2e	11,088.9	9,617.5	N/A	20,706.5

Table B-15
CR #1 PTA Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Post-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	UNCONTROL EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS * (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Based on controlled & efficiency	10.00	8,760	43.8	Assume 0 removal for control device
			PM_{10}	-		10.00	8,760	43.8	
			$PM_{2.5}$	-		10.00	8,760	43.8	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	2014 Testing	20.00	8,760	87.6	Assume 0 removal for control device
			CO		2014 Testing	24.00	8,760	105.1	
			PM	-	Based on controlled & efficiency	121.00	8,760	530.0	
			PM_{10}	-		121.00	8,760	530.0	
			$PM_{2.5}$	-		121.00	8,760	530.0	
Dryer Scrubber	CM-404A	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM_{10}	-		30.00	8,760	131.4	
			$PM_{2.5}$	-		30.00	8,760	131.4	
Dryer Scrubber	CM-404B	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM_{10}	-		30.00	8,760	131.4	
			$PM_{2.5}$	-		30.00	8,760	131.4	
Day Silo Baghouse	CM-603A	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	42.43	8,760	185.8	
			$PM_{2.5}$	1.00	USEPA Handbook	42.43	8,760	185.8	
Day Silo Baghouse	CM-603B	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	42.43	8,760	185.8	
			$PM_{2.5}$	1.00	USEPA Handbook	42.43	8,760	185.8	
Rotary Lock A Dust Collector	CM-608A	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	0.86	8,760	3.8	
			$PM_{2.5}$	1.00	USEPA Handbook	0.86	8,760	3.8	
Rotary Lock B Dust Collector	CM-608B	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	0.86	8,760	3.8	
			$PM_{2.5}$	1.00	USEPA Handbook	0.86	8,760	3.8	

Table B-15
CR #1 PTA Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Pre-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	UNCONTROL EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS* (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Based on controlled & efficiency	10.00	8,760	43.8	Assume 0 removal for control device
			PM_{10}	-		10.00	8,760	43.8	
			$PM_{2.5}$	-		10.00	8,760	43.8	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	Source Test	7.00	8,760	30.7	
			PM	-	Based on controlled & efficiency	180.00	8,760	788.4	Assume 0 removal for control device
			PM_{10}	-		180.00	8,760	788.4	
			$PM_{2.5}$	-		180.00	8,760	788.4	
Dryer Scrubber	CM-404A	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM_{10}	-		30.00	8,760	131.4	
			$PM_{2.5}$	-		30.00	8,760	131.4	
Dryer Scrubber	CM-404B	-	PM	-	Based on controlled & efficiency	30.00	8,760	131.4	Assume 0 removal for control device
			PM_{10}	-		30.00	8,760	131.4	
			$PM_{2.5}$	-		30.00	8,760	131.4	
Day Silo Baghouse	CM-603A	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	42.43	8,760	185.8	
			$PM_{2.5}$	1.00	USEPA Handbook	42.43	8,760	185.8	
Day Silo Baghouse	CM-603B	4,950	PM	1.00	USEPA Handbook	42.43	8,760	185.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	42.43	8,760	185.8	
			$PM_{2.5}$	1.00	USEPA Handbook	42.43	8,760	185.8	
Rotary Lock A Dust Collector	CM-608A	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	0.86	8,760	3.8	
			$PM_{2.5}$	1.00	USEPA Handbook	0.86	8,760	3.8	
Rotary Lock B Dust Collector	CM-608B	100	PM	1.00	USEPA Handbook	0.86	8,760	3.8	Assume 0 removal for control device
			PM_{10}	1.00	USEPA Handbook	0.86	8,760	3.8	
			$PM_{2.5}$	1.00	USEPA Handbook	0.86	8,760	3.8	

TOTAL POST-PROJECT EMISSIONS - #1 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	87.6	NA	87.6
CO	105.1	NA	105.1
SO_2	0	NA	0
PM	1,215.8	NA	1,215.8
PM_{10}	1,215.8	NA	1,215.8
$PM_{2.5}$	1,215.8	NA	1,215.8

*Using stack test data and a 99% control device efficiency for PM

TOTAL PRE-PROJECT EMISSIONS - #1 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO_2	0	NA	0
PM	1,474.2	NA	1,474.2
PM_{10}	1,474.2	NA	1,474.2
$PM_{2.5}$	1,474.2	NA	1,474.2

Table B-16
CR #2 PTA Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Post-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS* (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	0	Based on controlled & efficiency	4.00	8,760	17.5	Assume 0 removal for control device
			PM_{10}	0		4.00	8,760	17.5	
			$PM_{2.5}$	0		4.00	8,760	17.5	
Crystallizer Vent Scrubber	DM-601	54	PM	0	Based on controlled & efficiency	54.00	8,760	236.5	Assume 0 removal for control device
		54	PM_{10}	0		54.00	8,760	236.5	
		54	$PM_{2.5}$	0		54.00	8,760	236.5	
		6.5	CO	0	2014 Testing	20.00	8,760	87.6	
		20	VOC	0	2014 Testing	20.00	8,760	87.6	
Dryer Scrubber	DM-704	5.2	PM	0	Based on controlled & efficiency	5.20	8,760	22.8	Assume 0 removal for control device
			PM_{10}	0		5.20	8,760	22.8	
			$PM_{2.5}$	0		5.20	8,760	22.8	
Day Silo Dust Collector	DM-797A	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM_{10}	0		265.00	8,760	1,160.7	
			$PM_{2.5}$	0		265.00	8,760	1,160.7	
Day Silo Dust Collector	DM-797B	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM_{10}	0		265.00	8,760	1,160.7	
			$PM_{2.5}$	0		265.00	8,760	1,160.7	
Product Recovery Unit	MLSR-2		PM	0	Based on controlled & efficiency	0.100	8,760	0.4	Assume 0 removal for control device
			PM_{10}	0		0.100	8,760	0.4	
			$PM_{2.5}$	0		0.100	8,760	0.4	

Table B-16
CR #2 PTA Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Pre-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS* (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	0	Based on controlled & efficiency	4.00	8,760	17.5	Assume 0 removal for control device
			PM_{10}	0		4.00	8,760	17.5	
			$PM_{2.5}$	0		4.00	8,760	17.5	
Crystallizer Vent Scrubber	DM-601	54	PM	0	Based on controlled & efficiency	54.00	8,760	236.5	Assume 0 removal for control device
		54	PM_{10}	0		54.00	8,760	236.5	
		54	$PM_{2.5}$	0		54.00	8,760	236.5	
		7	VOC	0	Source Test	7.00	8,760	30.7	
Dryer Scrubber	DM-704	5.2	PM	0	Based on controlled & efficiency	5.20	8,760	22.8	Assume 0 removal for control device
			PM_{10}	0		5.20	8,760	22.8	
			$PM_{2.5}$	0		5.20	8,760	22.8	
Day Silo Dust Collector	DM-797A	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM_{10}	0		265.00	8,760	1,160.7	
			$PM_{2.5}$	0		265.00	8,760	1,160.7	
Day Silo Dust Collector	DM-797B	265	PM	0	Based on controlled & efficiency	265.00	8,760	1,160.7	Assume 0 removal for control device
			PM_{10}	0		265.00	8,760	1,160.7	
			$PM_{2.5}$	0		265.00	8,760	1,160.7	
Product Recovery Unit	MLSR-2		PM	0	Based on controlled & efficiency	0.100	8,760	0.4	Assume 0 removal for control device
			PM_{10}	0		0.100	8,760	0.4	
			$PM_{2.5}$	0		0.100	8,760	0.4	

TOTAL POST-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	87.6	NA	87.6
CO	87.6	NA	87.6
SO_2	0	NA	0
PM	2,598.7	NA	2,598.7
PM_{10}	2,598.7	NA	2,598.7
$PM_{2.5}$	2,598.7	NA	2,598.7

*Using stack test data and a 99% control device efficiency for PM

TOTAL PRE-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO_2	0	NA	0
PM	2,598.7	NA	2,598.7
PM_{10}	2,598.7	NA	2,598.7
$PM_{2.5}$	2,598.7	NA	2,598.7

Table B-17
Cooling Towers Uncontrolled Pre- and Post-Project PTE Emissions

PTE - Uncontrolled Post-Project

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	97000	PM	0	Table B-30	14.56	8,760	63.8	Reisman, Frisbie, 2002
			PM_{10}	0	Table B-30	10.57	8,760	46.3	Reisman, Frisbie, 2002
			$PM_{2.5}$	0	Table B-30	0.03	8,760	0.1	Reisman, Frisbie, 2002
Cooling Tower	AT-202	97000	PM	0	Table B-30	14.56	8,760	63.8	Reisman, Frisbie, 2002
			PM_{10}	0	Table B-30	10.57	8,760	46.3	Reisman, Frisbie, 2002
			$PM_{2.5}$	0	Table B-30	0.03	8,760	0.1	Reisman, Frisbie, 2002

PTE - Uncontrolled Pre-Project

Cooling Tower	AT-201	68000	PM	0	Table B-30	10.21	8,760	44.7	Reisman, Frisbie, 2002
			PM_{10}	0	Table B-30	7.41	8,760	32.5	Reisman, Frisbie, 2002
			$PM_{2.5}$	0	Table B-30	0.02	8,760	0.1	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	0	Table B-30	10.21	8,760	44.7	Reisman, Frisbie, 2002
			PM_{10}	0	Table B-30	7.41	8,760	32.5	Reisman, Frisbie, 2002
			$PM_{2.5}$	0	Table B-30	0.02	8,760	0.1	Reisman, Frisbie, 2002

TOTAL POST-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO_2	0	NA	0
PM	127.6	NA	127.6
PM_{10}	92.6	NA	92.6
$PM_{2.5}$	0.3	NA	0.3

TOTAL PRE-PROJECT EMISSIONS - #2 PTA (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO_2	0	NA	0
PM	89.4	NA	89.4
PM_{10}	64.9	NA	64.9
$PM_{2.5}$	0.2	NA	0.2

Table B-18

Fugitive Uncontrolled Pre- and Post-Project PTE Emissions

Post-Project-Uncontrolled (No LDAR Program)

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item	0.0089	0.0132	0.0040	0.0439	0.2293	0.0439	0.0439			
#1 OX Unit (HON)	218	0	398	4	3	1	0	11691.44	38971	19.49
#1 OX (NSPS as HON)	2023	85	4215	34	17	18	5	4641.39	372230	186.12
#2 OX (HON)	244	0	534	3	4	1	0	14234.37	47432	23.72
#2 OX (NSPS as HON)	1960	202	4325	37	13	15	4	4693.26	376390	188.19
OSBL (HON)	303	1	588	6	4	0	0	54818.52	54819	27.41
Total	4748.11	288.11	10060.10	84.04	41.23	35.04	9.04	90,079	889,842	**444.92**

Project LDAR Impact 10.00%

Factors	USEPA Factor kg/hr	lb/kg	EF lb/hr
Valves, Liquid	0.00403	2.204623	0.00888
Valves, Gas	0.00597	2.204623	0.01316
Flanges , Drains, Vents, Other	0.00183	2.204623	0.00403
Pumps	0.01990	2.204623	0.04387
Relief Valves	0.10400	2.204623	0.22928
Agitators	0.01990	2.204623	0.04387
Compressors	0.01990	2.204623	0.04387
Sample Connection	0.01500	2.204623	0.03307

USEPA Factor is based on table 2-1 from USEPA Report of 1995 on LDAR Emission factors - Average Emission Factors

Effectiveness factors - HON are based on Table 5-9 from 1995 USEPA Report, NSPS from EIIP Volume II, Table 4.2.2

Pre-Project-Uncontrolled (No LDAR Program)

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item	0.0089	0.0132	0.0040	0.0439	0.2293	0.0439	0.0439			
#1 OX Unit (HON)	198	0	362	4	3	1	0	10845.32	36151	18.08
#1 OX (NSPS as HON)	1839	77	3678	34	17	18	5	4215.12	338044	169.02
#2 OX (HON)	222	0	485	3	4	1	0	13201.46	43990	22.00
#2 OX (NSPS as HON)	1782	184	3932	37	13	15	4	4320.59	346503	173.25
OSBL (HON)	303	1	588	6	4	0	0	54818.52	54819	27.41
Total	4344.01	262.01	9045.00	84.04	41.23	35.04	9.04	87,401	819,507	**409.75**

Pre-Project Controlled Emissions

Table B-19

Facility Pre-Project Controlled PTE Data Summary

Pre-Project Controlled PTE Emissions (tpy)

POLLUTANTS	CR #1 OX	CR #2 OX	CR #1 PTA	CR #2 PTA	TANK FARM	COOLING TOWER	TOTAL
NOx	0.5	12.9	0	0	0	0	13.4
VOC	441.8	164.1	30.7	30.7	4.2	0	671.4
CO	1,890.1	357.6	0	0	0	0	2,247.7
SO_2	0.03	0.1	0	0	0	0	0.2
PM	9.5	1.1	15.1	6.0	0	2.7	34.4
PM_{10}	9.5	1.1	15.1	6.0	0	1.9	33.7
$PM_{2.5}$	9.5	1.1	15.1	6.0	0	0.01	31.8
CO_2e	54,143	40,713	-	-	-	-	94,856

Pre-Project Facility-Wide PTE

POLLUTANTS	MODIFIED UNITS	UNMODIFIED UNITS	FACILITY TOTAL
NOx	13.4	311.2	324.6
VOC	671.4	89.8	761.3
CO	2,247.7	286.1	2,533.8
SO_2	0.2	188.9	189.1
PM	34.4	47.4	81.8
PM_{10}	33.7	44.3	78.0
$PM_{2.5}$	31.8	42.0	73.8
CO_2e	94,856	418,175	513,031

Table B-20
CR #1 OX Pre-Project PTE Emissions

#1 OX PTE - Pre-Project Emissions

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE (HP)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Emergency Generator #2	BM-1201	335	NOx	0.031	lb/hp-hr	AP-42 3.3 (10/96)	10.385	100	0.5	Diesel Fuel Sulfur = 0.05%, Hours per RICE MACT limit
			VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.842	100	0.04	
			CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.238	100	0.1	
			SO_2	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.687	100	0.03	
			PM	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			PM_{10}	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			$PM_{2.5}$	0.0022	lb/hp-hr	AP-42 3.3 (10/96)	0.737	100	0.04	
			CO_2e	163.6	lb/MMBtu	USEPA Data	137.634	100	6.9	
HPVGTS	HPVGTS-1	131	VOC	85.0	% Removal	Vendor Data	19.65	8,760	87.0	Hourly rates don't match annual emissions.
		234	CO	85.0	% Removal	Vendor Data	35.10	8,760	1,470.0	
		10000.0	CO_2e	0	% Removal	BP calc/USEPA Data	11250	8,760	49,275.0	
Low Pressure Absorber	BT-603	18.2	VOC			BP Calcs	18.20	8,760	80	Recovery Device
		9	CO			BP Calcs	9.13	8,760	40.0	
		400.0	CO_2e			USEPA Data	400.0	8,760	1,752.0	
CRU Extraction Drum	BD-625	CRU will be removed	VOC			BP Calcs	1.0	8,760	4.4	Project will remove CRU
CRU Surge Drum	BD-631		VOC			BP Calcs	4.0	8,760	17.5	
CRU Waste Slurry Drum	BD-632		VOC			BP Calcs	0.003	8,760	0.01	
Silo Scrubber	BT-501		PM	98	% Removal	Source Test	2.16	8,760	9.5	
			PM_{10}	98	% Removal	Source Test	2.16	8,760	9.5	
			$PM_{2.5}$	98	% Removal	Source Test	2.16	8,760	9.5	
CRU Evaporator Overhd Condenser	BE-645	CRU will be removed	VOC			BP Calcs	0.3	8,760	1.3	Project will remove CRU
DHT Ovhd Scrubber	BT-702	Vent will be removed	VOC			BP Calcs	60.0	8,760	165.0	Project will remove vent - VOC hourly rates don't match annual
			CO			BP Calcs	87.0	8,760	380.0	
			CO_2e			BP calc/USEPA Data	711.4	8,760	3,115.9	
Process Fugitives			VOC			USEPA LDAR EF	19.8	8,760	86.8	

TOTAL PRE-PROJECT EMISSIONS - #1 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES	COMBUSTION SOURCES	FUGITIVE SOURCES	TOTALS
NOx	0	0.5	N/A	0.5
VOC	354.9	0.04	86.8	441.8
CO	1,890.0	0.1	N/A	1,890.1
SO_2	0	0.03	N/A	0.03
PM	9.5	0.04	N/A	9.5
PM_{10}	9.5	0.04	N/A	9.5
$PM_{2.5}$	9.5	0.04	N/A	9.5
CO_2e	54,142.9	6.9	N/A	54,149.8

Table B-21
#2 OX Pre-Project PTE Emissions

#2 OX PTE - Pre-Project Emissions

			NATURAL GAS						DIESEL FUEL (SULFUR = 0.05%)				
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM FIRE RATE	POLLUTANT EMITTED	AP-42 1.4 FACTOR (lb/MM scf)	NATURAL GAS EF (lb/MMBtu)	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	AP-42 FACTOR (lb/hp-hr)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMIT OPERATE (hpy)	Annual Emission (tpy) - Oil
Emergency Generator #3	DM-135	1072.8 hp	NOx						0.024	AP-42 3.4 (10/96)	25.75	500	6.44
			VOC						0.000642	AP-42 3.4 (10/96)	0.69	500	0.17
			CO						0.0055	AP-42 3.4 (10/96)	5.90	500	1.48
			SO_2						0.00040	AP-42 3.4 (10/96)	0.43	500	0.11
			PM						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			PM_{10}						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			$PM_{2.5}$						0.0007	AP-42 3.4 (10/96)	0.75	500	0.19
			CO_2e						163.6	lb/MMBtu-USEPA	440.76	500	110.19
HPVGTS Heater	DB-1813	15.0 MMBtu/hr	NOx	100	0.098	1.47	8,760	6.4					
			VOC	5.5	0.005	0.08	8,760	0.4					
			CO	84	0.082	1.24	8,760	5.4					
			SO_2	0.6	0.001	0.01	8,760	0.04					
			PM	7.6	0.007	0.11	8,760	0.5					
			PM_{10}	7.6	0.007	0.11	8,760	0.5					
			$PM_{2.5}$	7.6	0.007	0.11	8,760	0.5					
			CO_2e	----	117.000	1,755.00	8,760	7,687.0					

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EF (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	PERMIT OPERATE (hpy)	ANNUAL EMISSION (tpy)	COMMENTS
HPVGTS	DR-1814/ DT-1821	285	VOC	98%	Vendor Data	5.70	8,760	25.0	
		1589	CO	95%	BP Calcs	79.5	8,760	348.4	
		5000	CO_2e	0	BP calc/USEPA Data	7,500.00	8,760	32,850.0	
Low Pressure Absorber	DT-302	10.5	VOC		BP Calcs	10.48	8,760	45.9	
		0.5	CO		BP Calcs	0.52	8,760	2.3	
		15.0	CO_2e		BP calc/USEPA Data	15.0	8,760	65.8	
Intermediate Silo Scrubber	DT-500	10.4	PM	99	BP Calcs	0.10	8,760	0.5	
			PM_{10}	99	BP Calcs	0.10	8,760	0.5	
			$PM_{2.5}$	99	BP Calcs	0.10	8,760	0.5	
CRU Extraction Drum	DD-412	CRU will be removed	VOC		BP Calcs	0.01	8,760	0.02	Project will remove CRU
CRU Waste Slurry Drum	DD-413		VOC		BP Calcs	0.04	8,760	0.2	
CRU Mother Liquor Drum	DD-414		VOC		BP Calcs	0.04	8,760	0.2	
CRU Evaporation Drum	DE-416		VOC		BP Calcs	1.04	8,760	4.5	
Process Fugitives			VOC		USEPA LDAR EF	20.1	8,760	87.8	

TOTAL PRE-PROJECT EMISSIONS - #2 OX PTE (tpy)				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NOx	0	12.9	N/A	12.9
VOC	75.8	0.5	87.8	164.1
CO	350.7	6.9	N/A	357.6
SO_2	0	0.1	N/A	0.1
PM	0.5	0.7	N/A	1.1
PM_{10}	0.5	0.7	N/A	1.1
$PM_{2.5}$	0.5	0.7	N/A	1.1
CO_2e	32,915.8	7797.2	N/A	40,713.0

Table B-22
CR #1 PTA Pre-Project PTE Emissions

#1 PTA PTE - Pre-Project Emissions

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	CH-108	-	PM	-	Source Test	0.10	8,760	0.4	
			PM_{10}	-	Source Test	0.10	8,760	0.4	
			$PM_{2.5}$	-	Source Test	0.10	8,760	0.4	
Crystallizer Vent Scrubber	CM-301	-	VOC	-	Source Test	7.00	8,760	30.7	
			PM	-	Source Test	1.80	8,760	7.9	
			PM_{10}	-	Source Test	1.80	8,760	7.9	
			$PM_{2.5}$	-	Source Test	1.80	8,760	7.9	
Dryer Scrubber	CM-404A	-	PM	-	Source Test	0.30	8,760	1.3	
			PM_{10}	-	Source Test	0.30	8,760	1.3	
			$PM_{2.5}$	-	Source Test	0.30	8,760	1.3	
Dryer Scrubber	CM-404B		PM	-	Source Test	0.30	8,760	1.3	
			PM_{10}	-	Source Test	0.30	8,760	1.3	
			$PM_{2.5}$	-	Source Test	0.30	8,760	1.3	
Day Silo Baghouse	CM-603A	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Day Silo Baghouse	CM-603B	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	
			PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
			$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Rotary Lock A Dust Collector	CM-608A	600	PM	0.01	USEPA Handbook	0.05	8,760	0.2	
			PM_{10}	0.01	USEPA Handbook	0.05	8,760	0.2	
			$PM_{2.5}$	0.01	USEPA Handbook	0.05	8,760	0.2	
Rotary Lock B Dust Collector	CM-608B	600	PM	0.01	USEPA Handbook	0.05	8,760	0.2	
			PM_{10}	0.01	USEPA Handbook	0.05	8,760	0.2	
			$PM_{2.5}$	0.01	USEPA Handbook	0.05	8,760	0.2	

TOTAL PRE-PROJECT EMISSIONS - #1 PTA PTE (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO_2	0	NA	0
PM	15.1	NA	15.12
PM_{10}	15.1	NA	15.12
$PM_{2.5}$	15.1	NA	15.12

Table B-23
CR #2 PTA Pre-Project PTE Emissions

#2 PTA PTE - Pre-Project Emissions

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (lb/hr)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Feed Slurry Drum Scrubber	DH-518	4	PM	99	Vendor Data	0.04	8,760	0.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99	Vendor Data	0.04	8,760	0.2	
			$PM_{2.5}$	99	Vendor Data	0.04	8,760	0.2	
Crystallizer Vent Scrubber	DM-601	54	PM	99	Vendor Data	0.54	8,760	2.4	Maximum PM rates based on hourly emissions and % removal
		54	PM_{10}	99	Vendor Data	0.54	8,760	2.4	
		54	$PM_{2.5}$	99	Vendor Data	0.54	8,760	2.4	
		25.5	VOC	0	Source Test	7.00	8,760	30.7	
Dryer Scrubber	DM-704	5.2	PM	95	Vendor Data	0.26	8,760	1.1	Maximum rate based on hourly emissions and % removal
			PM_{10}	95	Vendor Data	0.26	8,760	1.1	
			$PM_{2.5}$	95	Vendor Data	0.26	8,760	1.1	
Day Silo Dust Collector	DM-797A	265	PM	99.9	Vendor Data	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9	Vendor Data	0.27	8,760	1.2	
			$PM_{2.5}$	99.9	Vendor Data	0.27	8,760	1.2	
Day Silo Dust Collector	DM-797B	265	PM	99.9	Vendor Data	0.27	8,760	1.2	Maximum rate based on hourly emissions and % removal
			PM_{10}	99.9	Vendor Data	0.27	8,760	1.2	
			$PM_{2.5}$	99.9	Vendor Data	0.27	8,760	1.2	
Product Recovery Unit	MLSR-2		PM		BP Calcs	0.001	8,760	0.004	
			PM_{10}		BP Calcs	0.001	8,760	0.004	
			$PM_{2.5}$		BP Calcs	0.001	8,760	0.004	

TOTAL PRE-PROJECT EMISSIONS - #1 PTA PTE (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	30.7	NA	30.7
CO	0	NA	0
SO_2	0	NA	0
PM	6.0	NA	6.0
PM_{10}	6.0	NA	6.0
$PM_{2.5}$	6.0	NA	6.0

Table B-24
Cooling Towers Pre-Project PTE Emissions

Cooling Tower Pre-Project Controlled PTE Emissions (tpy)

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	MAXIMUM RATE (gpm)	POLLUTANT EMITTED	POLLUTANT EMISSION FACTOR (% Removal)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hpy)	ANNUAL EMISSIONS (tpy)	COMMENTS
Cooling Tower	AT-201	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002
Cooling Tower	AT-202	68000	PM	97	Table B-30	0.31	8,760	1.3	Reisman, Frisbie, 2002
			PM_{10}	97	Table B-30	0.22	8,760	1.0	Reisman, Frisbie, 2002
			$PM_{2.5}$	97	Table B-30	0.001	8,760	0.003	Reisman, Frisbie, 2002

TOTAL PRE-PROJECT EMISSIONS - COOLING TOWER (tpy)			
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	TOTALS
NOx	0	NA	0
VOC	0	NA	0
CO	0	NA	0
SO_2	0	NA	0
PM	2.7	NA	2.7
PM_{10}	1.9	NA	1.9
$PM_{2.5}$	0.01	NA	0.01

Table B-25
Fugitive Pre-Project PTE Emissions

Facility Fugitives PTE - Pre-Project

	VALVES, LIQUID	VALVES, GAS	FLANGES DRAINS, VENTS & OTHERS	PUMPS	RELIEF VALVES	AGITATORS	COMPRESSORS	% VOC	TOTAL HAPS EMISSIONS (lb/yr)	TOTAL STREAM (lb/yr)	TOTAL STREAM (tpy)
EF, lb/hr/item: (NSPS)	0.00347	0.00434	0.00270	0.01360	0.08942	0.01360	0.01360				
EF, lb/hr/item: (HON)	0.00107	0.00105	0.00028	0.01097	0.02751	0.01097	0.01097				
#1 OX Unit (HON)	198	0	362	4	3	1	0	100.0	1184.47	3948	1.97
#1 OX (NSPS)	1839	77	3832	34	17	18	5	100.0	2114.70	169595	84.80
#2 OX (HON)	222	0	485	3	4	1	0	100.0	1386.95	4622	2.31
#2 OX (NSPS)	1782	184	3932	37	13	15	4	100.0	2132.86	171052	85.53
OSBL (HON)	303	1	588	6	4	0	0	100.0	5834.33	5834	2.92
Total	4344.00	262.01	9199.00	84.02	41.12	35.02	9.02		12,653	355,051	**177.53**

Factors	**USEPA Factor** **kg/hr**	**lb/kg**	**EF** **lb/hr**	**Effectiveness Factor** **HON**	**NSPS**
Valves, Liquid	0.00403	2.204623	0.00888	0.88	0.61
Valves, Gas	0.00597	2.204623	0.01316	0.92	0.67
Flanges , Drains, Vents, Other	0.00183	2.204623	0.00403	0.93	0.33
Pumps	0.01990	2.204623	0.04387	0.75	0.69
Relief Valves	0.10400	2.204623	0.22928	0.88	0.61
Agitators	0.01990	2.204623	0.04387	0.75	0.69
Compressors	0.01990	2.204623	0.04387	0.75	0.69
Sample Connection	0.01500	2.204623	0.03307	0.93	0.33

USEPA Factor is based on table 2-1 from USEPA Report of 1995 on LDAR Emission factors - Average Emission Factors

Effectiveness factors - HON are based on Table 5-9 from 1995 USEPA Report, NSPS from EIIP Volume II, Table 4.2.2

Unmodified Units

Table B-26
Unmodified Units
Controlled and Uncontrolled PTE Emissions

Controlled Emissions - tpy

POLLUTANTS	SHIP AND LOAD	UTILITY	WWT	TOTAL
NOx	0	311.2	0	311.2
VOC	0	21.2	68.6	89.8
CO	0	286.1	0	286.1
SO_2	0	188.9	0	188.9
PM	13.6	33.8	0	47.4
PM_{10}	13.6	30.7	0	44.3
$PM_{2.5}$	13.6	28.4	0	42.0
CO_2e	0	418,174.8	0	418,174.8

Uncontrolled Emissions - tpy

POLLUTANTS	SHIP AND LOAD	UTILITY	WWT	TOTAL
NOx	0	311.2	0	311.2
VOC	0	21.2	68.6	89.8
CO	0	286.1	0	286.1
SO_2	0	188.9	0	188.9
PM	1,362.2	33.8	0	1,396.0
PM_{10}	1,362.2	30.7	0	1,392.9
$PM_{2.5}$	1,362.3	28.4	0	1,390.7
CO_2e	0	418,174.8	0	418,174.8

Table B-27
Shipping -Loading Controlled and Uncontrolled PTE Emissions

Ship and Load - Controlled

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EF (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
				$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
				$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.42	8,761	1.9	
				$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,762	1.9	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.42	8,760	1.9	
				$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,760	1.9	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	0.01	USEPA Handbook	0.42	8,760	1.9	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.42	8,761	1.9	
				$PM_{2.5}$	0.01	USEPA Handbook	0.42	8,762	1.9	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Source Test	0.48	8,760	2.1	
				PM_{10}	-	Source Test	0.48	8,760	2.1	
				$PM_{2.5}$	-	Source Test	0.48	8,760	2.1	
Load Spout A Dust Collector	CM-705A	SL-7	1,200	PM	0.01	USEPA Handbook	0.10	8,760	0.5	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.10	8,760	0.5	
				$PM_{2.5}$	0.01	USEPA Handbook	0.10	8,760	0.5	
Load Spout B Dust Collcetor	CM-705B	SL-8	1,200	PM	0.01	USEPA Handbook	0.10	8,760	0.5	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.10	8,760	0.5	
				$PM_{2.5}$	0.01	USEPA Handbook	0.10	8,760	0.5	
Load Spout C Dust Collector	CM-705C	SL-9	1,200	PM	0.01	USEPA Handbook	0.10	8,760	0.5	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	0.01	USEPA Handbook	0.10	8,760	0.5	
				$PM_{2.5}$	0.01	USEPA Handbook	0.10	8,760	0.5	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	0.20	8,760	0.9	
				PM_{10}	-	BP Calcs	0.20	8,760	0.9	
				$PM_{2.5}$	-	BP Calcs	0.20	8,760	0.9	

Table B-27
Shipping -Loading Controlled and Uncontrolled PTE Emissions

Ship and Load - Uncontrolled

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE (cfm)	POLLUTANT EMITTED	POLLUTANT EF (gr/cfm)	EMISSION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
Storage Silo A Baghouse	CM-701A	SL-1	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	42.43	8,760	185.8	
				$PM_{2.5}$	1	USEPA Handbook	42.43	8,760	185.8	
Storage Silo B Baghouse	CM-701B	SL-2	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	42.43	8,760	185.8	
				$PM_{2.5}$	1	USEPA Handbook	42.43	8,760	185.8	
Storage Silo C Baghouse	CM-701C	SL-3	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	42.43	8,761	185.9	
				$PM_{2.5}$	1	USEPA Handbook	42.43	8,762	185.9	
Storage Silo D Baghouse	CM-701D	SL-4	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	42.43	8,760	185.8	
				$PM_{2.5}$	1	USEPA Handbook	42.43	8,760	185.8	
Storage Silo E Baghouse	CM-701E	SL-5	4,950	PM	1	USEPA Handbook	42.43	8,760	185.8	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	42.43	8,761	185.9	
				$PM_{2.5}$	1	USEPA Handbook	42.43	8,762	185.9	
Storage Silo F Baghouse	CM-720 A/B	SL-6A/B		PM	-	Source Test	48.00	8,760	210.2	
				PM_{10}	-	Source Test	48.00	8,760	210.2	
				$PM_{2.5}$	-	Source Test	48.00	8,760	210.2	
Load Spout A Dust Collector	CM-705A	SL-7	1,200	PM	1	USEPA Handbook	10.29	8,760	45.1	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	10.29	8,760	45.1	
				$PM_{2.5}$	1	USEPA Handbook	10.29	8,760	45.1	
Load Spout B Dust Collcetor	CM-705B	SL-8	1,200	PM	1	USEPA Handbook	10.29	8,760	45.1	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	10.29	8,760	45.1	
				$PM_{2.5}$	1	USEPA Handbook	10.29	8,760	45.1	
Load Spout C Dust Collector	CM-705C	SL-9	1,200	PM	1	USEPA Handbook	10.29	8,760	45.1	EPA/625/6-91/014: Control Technologies for HAPs
				PM_{10}	1	USEPA Handbook	10.29	8,760	45.1	
				$PM_{2.5}$	1	USEPA Handbook	10.29	8,760	45.1	
Bulk Truck Loading Bag Filter	CM-722	SL-10		PM	-	BP Calcs	20.00	8,760	87.6	
				PM_{10}	-	BP Calcs	20.00	8,760	87.6	
				$PM_{2.5}$	-	BP Calcs	20.00	8,760	87.6	

Can only have flow to 4 of 6 silos at any one time.

TOTAL ANNUAL SHIPPING AND LOADING EMISSIONS - CONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO_x	0	NA	N/A	0
VOC	0	NA	N/A	0
CO	0	NA	N/A	0
SO_2	0	NA	N/A	0
PM	13.6	NA	N/A	13.6
PM_{10}	13.6	NA	N/A	13.6
$PM_{2.5}$	13.6	NA	N/A	13.6
CO_2e	NA	NA	N/A	0

TOTAL ANNUAL SHIPPING AND LOADING EMISSIONS - UNCONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO_x	0	NA	N/A	0
VOC	0	NA	N/A	0
CO	0	NA	N/A	0
SO_2	0	NA	N/A	0
PM	1,362.2	NA	N/A	1,362.2
PM_{10}	1,362.2	NA	N/A	1,362.2
$PM_{2.5}$	1,362.3	NA	N/A	1,362.3
CO_2e	NA	NA	N/A	0

Table B-28
Utility Controlled and Uncontrolled PTE Emissions

Combustion Sources

				NATURAL GAS						DIESEL (Engines 0.05% Sulfur/Boilers at 0.5% Sulfur)							NATURAL GAS REST OF YEAR (Oil at 862 hr/yr [2,400,000 gal/yr each])					COMB		
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT	EF (lb/MMBtu)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATE (hrs/yr)	ANNUAL EMISSION (tpy)	POLLUTANT	OIL EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSION (tpy) -Oil	POLLUTANT EMITTED	NG EMISSION FACTOR (lb/MMBtu)	HOURLY EMISSIONS (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSIONS (tpy) - NG	OIL AND NG ANNUAL EMISSIONS (tpy)	WORST-CASE ANNUAL EMISSION (tpy)	COMMENTS
Boiler #3	AB-350A	U-11	390 MMBtu*	NO_x	0.0800	Vendor Data	31.20	8,760	136.7	NO_x	0.10	lb/MMBtu	Vendor Data	39.00	862	16.8	NO_x	0.0800	31.20	7,898	123.2	140.0	140.0	Gas Boiler which only burns oil in gas curtailment. Oil is limited to less than 10% of capacity.
				VOC	0.0054	AP-42 1.4 (7/98)	2.10	8,760	9.2	VOC	0.20	lb/1000 gal	AP-42 1.3 (5/10)	0.56	862	0.2	VOC	0.0054	2.10	7,898	8.3	8.5	9.2	
				CO	0.0824	AP-42 1.4 (7/98)	32.12	8,760	140.7	CO	5.00	lb/1000 gal	AP-42 1.3 (5/10)	13.93	862	6.0	CO	0.0824	32.12	7,898	126.8	132.8	140.7	
				SO_2	0.0006	AP-42 1.4 (7/98)	0.23	8,760	1.0	SO_2	0.51	lb/MMBtu	Mass Balance	199.28	862	85.8	SO_2	0.0006	0.23	7,898	0.9	86.8	86.8	
				PM	0.0050	Vendor Data	1.95	8,760	8.5	PM	0.03	lb/MMBtu	Vendor Data	11.70	862	5.0	PM	0.0050	1.95	7,898	7.7	12.7	12.7	
				PM_{10}	0.0050	Vendor Data	1.95	8,760	8.5	PM_{10}	0.02	lb/MMBtu	Vendor Data	8.15	862	3.5	PM_{10}	0.0050	1.95	7,898	7.7	11.2	11.2	
				$PM_{2.5}$	0.0050	Vendor Data	1.95	8,760	8.5	$PM_{2.5}$	0.01	lb/MMBtu	Vendor Data	5.46	862	2.4	$PM_{2.5}$	0.0050	1.95	7,898	7.7	10.1	10.1	
				CO_2e	117.0	USEPA Factor	45,630.0	8,760	199,859.4	CO_2e	163.6	lb/MMBtu	Vendor Data	63,804.0	862	27,484.8	CO_2e	117.0	45,630.0	7,898	180,203.4	207,688.2	207,688.2	
Boiler #4	AB-350B	U-12	390 MMBtu*	NO_x	0.0800	Vendor Data	31.20	8,760	136.7	NO_x	0.1	lb/MMBtu	Vendor Data	39.00	862	16.8	NO_x	0.0800	31.20	7,898	123.2	140.0	140.0	Gas Boiler which only burns oil in gas curtailment. Oil is limited to less than 10% of capacity.
				VOC	0.0054	AP-42 1.4 (7/98)	2.10	8,760	9.2	VOC	0.76	lb/M gal	AP-42 1.3 (9/98)	2.12	862	0.9	VOC	0.0054	2.10	7,898	8.3	9.2	9.2	
				CO	0.0824	AP-42 1.4 (7/98)	32.12	8,760	140.7	CO	5.00	lb/M gal	AP-42 1.3 (9/98)	13.93	862	6.0	CO	0.0824	32.12	7,898	126.8	132.8	140.7	
				SO_2	0.0006	AP-42 1.4 (7/98)	0.23	8,760	1.0	SO_2	0.51	lb/MMBtu	Mass Balance	199.28	862	85.8	SO_2	0.0006	0.23	7,898	0.9	86.8	86.8	
				PM	0.0050	Vendor Data	1.95	8,760	8.5	PM	0.03	lb/MMBtu	Vendor Data	11.70	862	5.0	PM	0.0050	1.95	7,898	7.7	12.7	12.7	
				PM_{10}	0.0050	Vendor Data	1.95	8,760	8.5	PM_{10}	0.02	lb/MMBtu	Vendor Data	8.15	862	3.5	PM_{10}	0.0050	1.95	7,898	7.7	11.2	11.2	
				$PM_{2.5}$	0.0050	Vendor Data	1.95	8,760	8.5	$PM_{2.5}$	0.01	lb/MMBtu	Vendor Data	5.46	862	2.4	$PM_{2.5}$	0.0050	1.95	7,898	7.7	10.1	10.1	
				CO_2e	117.0	USEPA Factor	45,630.0	8,760	199,859.4	CO_2e	163.6	lb/MMBtu	Vendor Data	63,804.0	862	27,484.8	CO_2e	117.0	45,630.0	7,898	180,203.4	207,688.2	207,688.2	
Emergency Generator #1	AM-804	U-3	368.8 BHP							NO_x	0.031	lb/hp-hr	AP-42 3.3 (10/96)	11.43	100	0.6							0.6	275 KW Generator Hours limit set by MACT
										VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	0.93	100	0.05							0.05	
										CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.46	100	0.1							0.12	
										SO_2	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.76	100	0.04							0.04	
										PM	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.81	100	0.04							0.04	
										PM_{10}	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.81	100	0.04							0.04	
										$PM_{2.5}$	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.81	100	0.04							0.04	
										CO_2e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	424.09	100	21.2							21.2	
Compressor #1	AC-402	U-4	413 BHP							NO_x	0.031	lb/hp-hr	AP-42 3.3 (10/96)	12.80	100	0.6							0.6	Hours limited by MACT regulation
										VOC	0.00251	lb/hp-hr	AP-42 3.3 (10/96)	1.04	100	0.1							0.1	
										CO	0.00668	lb/hp-hr	AP-42 3.3 (10/96)	2.76	100	0.1							0.1	
										SO_2	0.00205	lb/hp-hr	AP-42 3.3 (10/96)	0.85	100	0.04							0.04	
										PM	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.91	100	0.05							0.05	
										PM_{10}	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.91	100	0.05							0.05	
										$PM_{2.5}$	0.00220	lb/hp-hr	AP-42 3.3 (10/96)	0.91	100	0.05							0.05	
										CO_2e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	474.95	100	23.7							23.7	
Emergency FW Pump	AG-202B	U-5	285 BHP							NO_x	0.012	lb/hp-hr	Vendor Data Submitted in 502B10 application March 2004	3.37	100	0.2							0.2	Pump replaced in 2004. Hours limited by MACT regulation
										VOC	0.001	lb/hp-hr		0.15	100	0.01							0.01	
										CO	0.002	lb/hp-hr		0.48	100	0.02							0.02	
										SO_2	0.0004	lb/hp-hr		0.12	100	0.01							0.01	
										PM	0.0003	lb/hp-hr		0.09	100	0.004							0.004	
										PM_{10}	0.0003	lb/hp-hr		0.09	100	0.004							0.004	
										$PM_{2.5}$	0.0003	lb/hp-hr		0.09	100	0.004							0.004	
										CO_2e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	327.75	100	16.4							16.4	
Compressor #2	AC-404	U-6	1200 BHP							NO_x	0.024	lb/hp-hr	Permit Limit	28.53	500	7.1							7.1	Hours limited by permit.
										VOC	0.001	lb/hp-hr		1.20	500	0.3							0.3	
										CO	0.001	lb/hp-hr		1.30	500	0.3							0.3	
										SO_2	0.002	lb/hp-hr		2.33	500	0.6							0.6	
										PM	0.0003	lb/hp-hr		0.35	500	0.1							0.1	
										PM_{10}	0.0003	lb/hp-hr		0.35	500	0.1							0.1	
										$PM_{2.5}$	0.0003	lb/hp-hr		0.35	500	0.1							0.1	
										CO_2e	1.16	lb/hp-hr	AP-42 3.4 (10/96)	1,392.0	500	348.0							348.0	
T-Head FW Pump	AG-229	U-7	224 BHP							NO_x	0.0057	lb/hp-hr	Vendor Data	1.28	100	0.1							0.1	Hours limited by MACT regulation
										VOC	0.00022	lb/hp-hr		0.05	100	0.002							0.002	
										CO	0.00132	lb/hp-hr		0.30	100	0.01							0.015	
										SO_2	0.00041	lb/hp-hr		0.09	100	0.005							0.005	
										PM	0.00018	lb/hp-hr		0.04	100	0.002							0.002	
										PM_{10}	0.00018	lb/hp-hr		0.04	100	0.002							0.002	
										$PM_{2.5}$	0.00018	lb/hp-hr		0.04	100	0.002							0.002	
										CO_2e	1.1500	lb/hp-hr	AP-42 3.3 (10/96)	257.60	100	12.9							12.9	

Table B-28
Utility Controlled and Uncontrolled PTE Emissions

				NATURAL GAS						DIESEL (Engines 0.05% Sulfur/Boilers at 0.5% Sulfur)							NATURAL GAS REST OF YEAR (Oil at 862 hr/yr [2,400,000 gal/yr each])					COMB		
EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT	EF (lb/MMBtu)	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATE (hrs/yr)	ANNUAL EMISSION (tpy)	POLLUTANT	OIL EMISSION FACTOR	UNITS	EMISSION FACTOR REFERENCE	HOURLY EMISSION (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSION (tpy) -Oil	POLLUTANT EMITTED	NG EMISSION FACTOR (lb/MMBtu)	HOURLY EMISSIONS (lb/hr)	OPERATION (hrs/yr)	ANNUAL EMISSIONS (tpy) - NG	OIL AND NG ANNUAL EMISSIONS (tpy)	WORST-CASE ANNUAL EMISSION (tpy)	COMMENTS
IT Emergency Generator	AM-838	U-8	670.5 BHP							NO_x	0.107	lb/hp-hr	Vendor Data Submitted in application December 2001	14.57	500	3.6							3.6	500 KW Generator Hours limited by permit
										VOC	0.00044	lb/hp-hr		0.06	500	0.02							0.02	
										CO	0.00402	lb/hp-hr		0.55	500	0.1							0.1	
										SO_2	0.01171	lb/hp-hr		1.60	500	0.4							0.4	
										PM	0.00498	lb/hp-hr		0.68	500	0.2							0.2	
										PM_{10}	0.00498	lb/hp-hr		0.68	500	0.2							0.2	
										$PM_{2.5}$	0.00498	lb/hp-hr		0.68	500	0.2							0.2	
										CO_2e	1.1613	lb/hp-hr	AP-42 3.4 (10/96)	158.7	500	39.7							39.7	
Emergency FW Pump	AG-202C	U-9	669 BHP							NO_x	0.022	lb/hp-hr	Vendor Data Submitted in application June 2003	14.65	250	1.8							1.8	New pump installed in 2004. Hours limited by permit.
										VOC	0.000	lb/hp-hr		0.22	250	0.03							0.03	
										CO	0.004	lb/hp-hr		2.94	250	0.4							0.4	
										SO_2	0.007	lb/hp-hr		4.72	250	0.6							0.6	
										PM	0.0004	lb/hp-hr		0.27	250	0.03							0.03	
										PM_{10}	0.0004	lb/hp-hr		0.27	250	0.03							0.03	
										$PM_{2.5}$	0.0004	lb/hp-hr		0.27	250	0.03							0.03	
										CO_2e	1.16	lb/hp-hr	AP-42 3.4 (10/96)	776.0	250	97.0							97.0	
Emergency FW Pump	AG-202D	U-10	669 BHP							NO_x	0.022	lb/hp-hr	Vendor Data Submitted in application June 2003	14.65	250	1.8							1.8	New pump installed in 2004. Hours limited by permit.
										VOC	0.000	lb/hp-hr		0.22	250	0.03							0.03	
										CO	0.004	lb/hp-hr		2.94	250	0.4							0.4	
										SO_2	0.007	lb/hp-hr		4.72	250	0.6							0.6	
										PM	0.0004	lb/hp-hr		0.27	250	0.03							0.03	
										PM_{10}	0.0004	lb/hp-hr		0.27	250	0.03							0.03	
										$PM_{2.5}$	0.0004	lb/hp-hr		0.27	250	0.03							0.03	
										CO_2e	1.16	lb/hp-hr	AP-42 3.4 (10/96)	776.0	250	97.0							97.0	
Compressor L-1	L-1	U-13	2.99 MMBtu/hr 1175 BHP							NO_x		-	Permit Limit	3.50	4,380	7.7							7.7	Total combined capacity of compressors L-1 & 2 shall be less than 2350 HP (5.98 Million Btu/hr)
										VOC		-		0.53	4,380	1.16							1.2	
										CO		-		0.75	4,380	1.64							1.6	
										SO_2		-		3.00	4,380	6.57							6.6	
										PM		-		1.80	4,380	3.94							3.9	
										PM_{10}		-		1.80	4,380	3.94							3.9	
										$PM_{2.5}$		-		1.80	4,380	3.94							3.9	
										CO_2e	163.6	lb/MMBtu	USEPA Factor	489.16	4,380	1071.3							1071.3	
Compressor L-2	L-2	U-14	2.99 MMBtu/hr 1175 BHP							NO_x		-	Permit Limit	3.50	4,380	7.7							7.7	Total combined capacity of compressors L-1 & 2 shall be less than 2350 HP (5.98 Million Btu/hr)
										VOC		-		0.53	4,380	1.16							1.2	
										CO		-		0.75	4,380	1.64							1.6	
										SO_2		-		3.00	4,380	6.57							6.6	
										PM		-		1.80	4,380	3.94							3.9	
										PM_{10}		-		1.80	4,380	3.94							3.9	
										$PM_{2.5}$		-		1.80	4,380	3.94							3.9	
										CO_2e	163.6	lb/MMBtu	USEPA Factor	489.16	4,380	1071.3							1071.3	

* Maximum shown for the boilers is the nominal boiler fire rate.

TOTAL ANNUAL UTILITY EMISSIONS - CONTROLLED				
POLLUTANT	PROCESS SOURCES (lb/hr)	COMBUSTION SOURCES (lb/hr)	FUGITIVE SOURCES (lb/hr)	TOTALS
NO_x	N/A	311.2	N/A	311.2
VOC	N/A	21.2	N/A	21.2
CO	N/A	286.1	N/A	286.1
SO_2	N/A	188.9	N/A	188.9
PM	N/A	33.8	N/A	33.8
PM_{10}	N/A	30.7	N/A	30.7
$PM_{2.5}$	N/A	28.4	N/A	28.4
CO_2e	N/A	418,174.8	N/A	418,174.8

TOTAL ANNUAL UTILITY EMISSIONS - UNCONTROLLED				
POLLUTANT	PROCESS SOURCES (lb/hr)	COMBUSTION SOURCES (lb/hr)	FUGITIVE SOURCES (lb/hr)	TOTALS
NO_x	N/A	311.2	N/A	311.2
VOC	N/A	21.2	N/A	21.2
CO	N/A	286.1	N/A	286.1
SO_2	N/A	188.9	N/A	188.9
PM	N/A	33.8	N/A	33.8
PM_{10}	N/A	30.7	N/A	30.7
$PM_{2.5}$	N/A	28.4	N/A	28.4
CO_2e	N/A	418,174.8	N/A	418,174.8

Table B-29
WWT Controlled and Uncontrolled PTE Emissions

WWT-Controlled

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR	EMISION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
CO_2 Stripper	AT-750	WT-10		VOC	-	BP Calcs	0.35	8,760	1.5	
Anaerobic Reactor / UASB	AM-775 / AR-751	WT-11**		VOC	-	BP Calcs	0.31	8,760	1.4	
WWTP Fugitives				VOC		USEPA Water 9.0	15	8,760	65.7	

** Flow normally zero.

WWT-Uncontrolled

EMISSION EQUIPMENT DESCRIPTION	EQUIPMENT ID NUMBER	STACK ID NUMBER	MAXIMUM RATE	POLLUTANT(S) EMITTED	POLLUTANT EMISSION FACTOR	EMISION FACTOR REFERENCE	HOURLY EMISSIONS (lb/hr)	PERMITTED OPERATING (hours/yr)	ANNUAL EMISSIONS (tpy)	COMMENTS
CO_2 Stripper	AT-750	WT-10		VOC	-	BP Calcs	0.35	8,760	1.5	
Anaerobic Reactor / UASB	AM-775 / AR-751	WT-11**		VOC	-	BP Calcs	0.31	8,760	1.4	
WWTP Fugitives				VOC		USEPA Water 9.0	15	8,760	65.7	

** Flow normally zero.

TOTAL ANNUAL WASTEWATER TREATMENT EMISSIONS - CONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO_x	0	0	NA	0
VOC	2.89	0.0	65.70	68.59
CO	0	0	NA	0
SO_2	0	0	NA	0
PM	0	0	NA	0
PM_{10}	0	0	NA	0
$PM_{2.5}$	0	0	NA	0
CO_2e	0	0	NA	0

TOTAL ANNUAL WASTEWATER TREATMENT EMISSIONS - UNCONTROLLED				
POLLUTANT	PROCESS SOURCES (tpy)	COMBUSTION SOURCES (tpy)	FUGITIVE SOURCES (tpy)	TOTALS
NO_x	0	0	NA	0
VOC	2.89	0.0	65.70	68.59
CO	0	0	NA	0
SO_2	0	0	NA	0
PM	0	0	NA	0
PM_{10}	0	0	NA	0
$PM_{2.5}$	0	0	NA	0
CO_2e	0	0	NA	0

Hazardous Air Pollutants Emissions

Table B-30
Hazardous Air Pollutants Emissions

#1 OX

EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
HPVGTS	HPVGTS-1	O-2/O-10/O-15	Acetaldehyde	0.004	0.02
			Benzene	1.21	5.3
			Formaldehyde	0.003	0.013
			Methanol	0.87	3.8
			Methyl Bromide	2.03	8.9
			Paraxylene	0.04	0.2
			Toluene	0.04	0.2
Atmospheric Absorber	BT-603	O-3	Benzene	1.47	6.7
			Formaldehyde	0.01	0.03
			Methanol	0.58	2.7
			Methyl Bromide	1.75	8.0
			Paraxylene	0.88	4.0
			Toluene	0.18	0.8
Equipment Fugitives			Paraxylene	5.00	21.7

#1 OX

POLLUTANT	lb/hr	tpy
Acetaldehyde	0.004	0.015
Benzene	2.68	12.0
Formaldehyde	0.01	0.04
Methanol	1.45	6.5
Methyl Bromide	3.78	16.9
Paraxylene	5.92	25.9
Toluene	0.22	1.0
Total HAPS	**14.08**	**62.4**

#1 PTA

EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
Crystallizer Vent Scrubber	CM-301	P-2	Acetaldehyde	0.12	0.5
			Benzene	0.01	0.03
			Formaldehyde	0.10	0.5
			Methanol	0.23	1.0
			Methyl Bronide	0	0
			Paraxylene	0.28	1.2
			Toluene	0.08	0.4
			Total	**0.82**	**3.6**

Table B-30
Hazardous Air Pollutants Emissions

#2 OX

EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
HPVGTS	HPVGTS-2	O2-3/4	Acetaldehyde	0.24	1.1
			Benzene	0.25	1.1
			Formaldehyde	0.46	2.0
			Methanol	0.97	4.2
			Methyl Bromide	0.22	0.9
			Paraxylene	0.75	3.3
			Toluene	0.18	0.8
Atmospheric Absorber	DT-302	O2-1	Benzene	1.42	6.2
			Formaldehyde	0.01	0.02
			Methanol	0.56	2.5
			Methyl Bromide	1.68	7.4
			Paraxylene	0.85	3.7
			Toluene	0.17	0.8
Equipment Fugitives			Paraxylene	5.06	22.2

#1 OX

POLLUTANT	lb/hr	tpy
Acetaldehyde	0.24	1.1
Benzene	1.67	7.3
Formaldehyde	0.47	2.1
Methanol	1.53	6.7
Methyl Bromide	1.90	8.3
Paraxylene	6.65	29.2
Toluene	0.35	1.5
Total HAPS	**12.81**	**56.2**

#2 PTA

EMISSION EQUIPMENT DESCRIPTION	EQUIP ID NUMBER	STACK ID NUMBER	POLLUTANT(S) EMITTED	HOURLY EMISSIONS (lb/hr)	ANNUAL EMISSIONS (tpy)
Crystallizer Vent Scrubber	DM-601	P2-2	Acetaldehyde	0.21	0.9
			Benzene	0.01	0.05
			Formaldehyde	0.19	0.8
			Methanol	0.41	1.8
			Methyl Bronide	0	0
			Paraxylene	0.51	2.2
			Toluene	0.14	0.6
			Total	**1.47**	**6.5**

Facility-Wide

POLLUTANT	lb/hr	tpy
Acetaldehyde	0.6	2.5
Benzene	4.4	19.4
Formaldehyde	0.8	3.4
Methanol	3.6	16.0
Methyl Bromide	5.7	25.2
Paraxylene	13.4	58.5
Toluene	0.8	3.5
Total HAPS	**29.2**	**128.6**

Table B-31
Cooling Tower PM Fractions and Emissions

Input Data

TDS	1500	ppmw	Annual Hours	8,760	hr/yr
Density of Water	0.000001	$\mu g/\mu m^3$	Conversion	60	min/hr
Density of particles	2.20E-06	$\mu g/\mu m^3$	Conversion	2,000	lb/ton
Recirculation Rate	97000	gpm			
Drift %	0.0006	%			
Density of Water	8.34	lb/gal			

Table 1 Results[(1)]

EPRI DROPLET DIAMETER (µm)	DROPLET VOLUME (μm^3)	DROPLET MASS (µg)	PARTICLE MASS (Solids) (µg)	SOLID PARTICLE VOLUME (μm^3)	SOLID PARTICLE DIAMETER (µm)	EPRI % MASS SMALLER
10	523.60	5.24E-04	7.85E-07	0.36	0.88	0.0000
20	4,188.79	4.19E-03	6.28E-06	2.86	1.76	0.196
30	14,137.17	1.41E-02	2.12E-05	9.64	2.64	0.226
40	33,510.32	3.35E-02	5.03E-05	22.85	3.52	0.514
50	65,449.85	6.54E-02	9.82E-05	44.62	4.40	1.816
60	113,097.34	1.13E-01	1.70E-04	77.11	5.28	5.702
70	179,594.38	1.80E-01	2.69E-04	122.45	6.16	21.348
90	381,703.51	3.82E-01	5.73E-04	260.25	7.92	49.812
110	696,909.97	6.97E-01	1.05E-03	475.17	9.68	70.509
130	1,150,346.51	1.15E+00	1.73E-03	784.33	11.44	82.023
150	1,767,145.87	1.77E+00	2.65E-03	1,204.87	13.20	88.012
180	3,053,628.06	3.05E+00	4.58E-03	2,082.02	15.84	91.032
210	4,849,048.26	4.85E+00	7.27E-03	3,306.17	18.48	92.468
240	7,238,229.47	7.24E+00	1.09E-02	4,935.16	21.12	94.091
270	10,305,994.70	1.03E+01	1.55E-02	7,026.81	23.76	94.689
300	14,137,166.94	1.41E+01	2.12E-02	9,638.98	26.40	96.288
350	22,449,297.50	2.24E+01	3.37E-02	15,306.34	30.81	97.011
400	33,510,321.64	3.35E+01	5.03E-02	22,847.95	35.21	98.340
450	47,712,938.43	4.77E+01	7.16E-02	32,531.55	39.61	99.071
500	65,449,846.95	6.54E+01	9.82E-02	44,624.90	44.01	99.071
600	113,097,335.53	1.13E+02	1.70E-01	77,111.82	52.81	100.000

[(1)] Based on "Calculating Realistic PM10 Emissions from Cooling Towers" by Reisman & Frisbie at Greystone Environmental Consultants

PM MASS FRACTIONS		LINEAR INTERPOLATION VALUES			
		SOLID PARTICLE DIAMETER		MASS FRACTION	
PM SIZE	MASS FRACTION	T1	T2	R1	R2
10	**72.591**	9.682	11.442	70.509	82.023
2.5	**0.221**	1.760	2.640	0.196	0.226

Cooling Tower Emission Rates

EMISSIONS	lb/hr	tpy
Total PM	**0.44**	**1.91**
PM_{10}	**0.32**	**1.39**
$PM_{2.5}$	**0.001**	**0.004**

Appendix C
RBLC Search Results

RBLC Search Results

VOC Emissions (Process Types 64.000, 64.003 and 64.999)

PROCESS TYPE	RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	CONTROL METHOD
64.000	TX-0624	Olefins Cracking Unit	801 tpy	IFR tanks and LDAR program
64.003	IA-0084	Main Fermenters	40 ppmvd	None
		Seed Fermenters	40 ppmvd	None
		Broth Tanks	0.02 lb/hr	None
		Solvent Recovery System	3.784 lb/hr	Scrubber
64.003	NE-0037	Stillage Evaporator	0.03 lb/hr	Wet Scrubber
		Steephouse	1.18 lb/hr	95% Eff. Thermal Oxidizer
		Fermentation	19.2 lb/hr	Wet scrubber
		Distillation Column	3.62 lb/hr	Wet scrubber
64.003	TX-0481	Process Steam Vent	0.01 lb/hr	None
		MSS Process Steam vent	0.01 lb/hr	None
64.003	OH-0284	Phenol II Process	208.43 lb/d	Condenser/TO/RTO
		Primary Cumene Stripper	3.59 lb/d	Condenser
		RTO for Cumene Oxid and Phenol II	6.17 lb/h	RTO
		Distillation of Alphamethylstyrene	75.16 lb/d	Condensers
		Cumene Oxidation Process	47.6 lb/d	Condenser/TO/RTO
		TO for Cumene Oxid and Phenol II	6.11 lb/hr	TO
64.003	NC-0111	Rotocel Operation Process Vents	10.8 lb/hr	Chilled Water Condenser/Scrubber
		Recovery Operation ARCON tank	8.76 lb/hr	Chilled Water Condenser
		Recovery Operation Stripper/Receiver	4.89 lb/hr	None
		Recovery Operation Stripper/Receiver	0.85 lb/hr	Chilled Water Condenser/Scrubber
		Botanical Extraction Process Vents	14.1 lb/hr	Chilled Water and liquid N2 Condensers
		Recovery Operation ARCON tank	0.80 lb/hr	Chilled Water Condenser/Scrubber
64.003	TX-0449	Analyzer Vents	0.22 lb/hr	None
64.003	WI-0207	Distillation P24-P29	127 lb/MM gal	Packed Scrubber Tower
		Distillation P46-P51	218 lb/MM gal	Packed Scrubber Tower
64.003	TX-0465	Glycol Vent	9.42 lb/hr	None
64.999	IN-0129	Rail TC Cleaning	98% Efficiency	Flare
64.999	NE-0042	Lactic Acid Production	5.53 lb/hr	98% Eff. RTO
		Fermentation	15.4 TPY	RTO
64.999	TX-0354	Incinerator Process Fugitives	0.01 lb/hr	LDAR Program
		Rundown Tank Fugitives	0.11 lb/hr	LDAR Program
		Incinerator	1.69 lb/hr	None
		Product Recovery Twr Fugitives	0.02 lb/hr	LDAR Program
		Acrolein Unit Column/Filter Cleaning	0.01 lb/hr	None

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
*IA-0106	STARTUP HEATER	0.0014	LB/MMBTU	P	GOOD OPERATING PRACTICES AND USE OF NATURAL GAS
*IA-0107	AUXILIARY BOILER	0.005	LB/MMBTU	N	
*IN-0158	TWO (2) NATURAL GAS AUXILIARY BOILERS	0.005	LB/MMBTU	P	GOOD COMBUSTION PRACTICES
*LA-0272	AMMONIA START-UP HEATER (102-B)	0.38	LB/H	P	GOOD COMBUSTION PRACTICES: PROPER DESIGN OF BURNER AND FIREBOX COMPONENTS; MAINTAINING THE PROPER AIR-TO-FUEL RATIO, RESIDENCE TIME, AND COMBUSTION ZONE TEMPERATURE.
*MI-0393	AUXILIARY BOILER	0.05	LB/H	N	
*MO-0082	DUAL-FIRED 85.6 MMBTU/HR WATER-TUBE BOILER	0.0055	LB/MMBTU	P	GOOD COMBUSTION PRACTICES
*OH-0350	STEAM BOILER	0.35	LB/H	P	PROPER BURNER DESIGN AND GOOD COMBUSTION PRACTICES
*OH-0352	AUXILIARY BOILER	0.59	LB/H	P	GOOD COMBUSTION PRACTICES AND USING COMBUSION OPTIMIZATION TECHNOLOGIES
*OH-0355	4 INDIRECT-FIRED AIR PREHEATERS	0.005	LB/MMBTU	N	
*PA-0291	AUXILIARY BOILER	0.0015	LB/MMBTU	N	
*PA-0296	AUXILIARY BOILER	0.14	TPY	N	
*SC-0149	NATURAL GAS BOILER EU004	0.003	LB/MMBTU	N	
*SC-0149	NATURAL GAS BOILER EU005	0.003	LB/MMBTU	N	
*SC-0149	NATURAL GAS BOILER EU006	0.003	LB/MMBTU	N	
AL-0230	NATURAL GAS-FIRED BATCH ANNEALING FURNACES (LA63, LA64)	0.0055	LB/MMBTU	N	
AL-0230	NATURAL GAS-FIRED PASSIVE ANNEALING FURNACE (LO41)	0.0055	LB/MMBTU	N	
AL-0230	3 NATURAL GAS-FIRED BOILERS WITH ULNB & EGR (537-539)	0.0055	LB/MMBTU	N	
AL-0230	NATURAL GAS-FIRED BATCH ANNEALING FURNACE (535)	0.0055	LB/MMBTU	N	
AL-0231	VACUUM DEGASSER BOILER	0.0026	LB/MMBTU	N	
AL-0231	GALVANIZING LINE FURNACE	0.0055	LB/MMBTU	N	
AR-0077	BOILERS	0.0055	LB/MMBTU	P	NATURAL GAS COMBUSTION ONLY
AR-0090	PICKLE LINE BOILERS, SN-52	0.2	LB/H	P	GOOD COMBUSTION PRACTICE
AZ-0047	AUXILIARY BOILER	0.0033	LB/MMBTU	N	
CA-1163	STEAM GENERATOR: OIL FIELD 5 TO < 33.5 MMBTU/HR	8.5	PPMV @ 3% O2	A	LOW-NOX BURNER AND FGR (VOC AS ROC)
CO-0058	HEATERS	0.016	LB/MMBTU	P	GOOD COMBUSTION PRACTICES
FL-0285	ONE GASEOUS-FUELED 99 MMTU/HR AUXILIARY BOILER	2	GR S/100 SCF	P	

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
FL-0286	TWO 99.8 MMBTU/H GAS-FUELED AUXILIARY BOILERS	2	GS/100 SCF GAS	P	
FL-0335	FOUR(4) NATURAL GAS BOILERS - 46 MMBTU/HOUR	0.003	LB/MMBTU	P	GOOD COMBUSTION PRACTICE
IA-0102	PUSHER PREHEAT FURNACE	0		P	THE COMPANY IS REQUIRED TO LIMIT THE AMOUNT OF OILS AND COOLANTS USED IN EARLIER PROCESSES AND APPLY GOOD COMBUSTION PRACTICES TO THE FURNACE. THERE ARE NO NUMERICAL LIMTS FOR VOCS.
IA-0102	ANNEALING FURNACE	0		P	THE COMPANY IS REQUIRED TO LIMIT THE AMOUNT OF OILS AND COOLANTS USED IN EARLIER PROCESSES AND APPLY GOOD COMBUSTION PRACTICES TO THE FURNACE. THERE ARE NO NUMERICAL LIMTS FOR VOCS.
IA-0102	CONTINUOUS HEAT TREAT LINE	0		P	THE COMPANY IS REQUIRED TO LIMIT THE AMOUNT OF OILS AND COOLANTS USED IN EARLIER PROCESSES AND APPLY GOOD COMBUSTION PRACTICES TO THE FURNACE. THERE ARE NO NUMERICAL LIMTS FOR VOCS.
LA-0186	DRYER BURNER (13.3 MM BTU/H)	0.095	LB/H	P	GOOD COMBUSTION PRACTICES CONSISTING OF USE OF PIPELINE NATURAL GAS AND PROPER OPERATING AND MAINTENANCE TECHNIQUES.
LA-0192	FUEL GAS HEATERS (3)	0.1	LB/H	P	GOOD COMBUSTION PRACTICES
LA-0203	AUXILIARY THERMAL OIL HEATER	0.43	LB/H	P	USE OF NATURAL GAS AS FUEL AND GOOD COMBUSTION PRACTICES
LA-0240	BOILERS	0.003	LB/MMBTU	P	GOOD EQUIPMENT DESIGN AND PROPER COMBUSTION TECHNIQUES
LA-0246	EQT0323 - Boiler 401F	0.53	LB/H	P	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND GASEOUS FUELS
MD-0035	VAPORIZATION HEATER	0.002	LB/MMBTU	N	NATURAL GAS COMBUSTION AND A CATALYTIC OXIDATION
MD-0035	EMERGENCY VENT HEATER	0.0054	LB/MMBTU	P	BURN NATURAL GAS AND GOOD COMBUSTION PRACTICES
MD-0036	FUEL GAS PROCESS HEATER	143	PPMVD	P	GOOD COMBUSTION PRACTICES
MD-0040	BOILER	0.002	LB/MMBTU	N	
MD-0040	HEATER	0.005	LB/MMBTU	N	
MN-0053	BOILER, NATURAL GAS (1)	0.006	LB/MMBTU	P	GOOD COMBUSTION.
MS-0085	NATURAL GAS FIRED BOILER	0.81	TPY	N	
NE-0026	NNII REHEAT FURNACE	0.0055	LB/MMBTU	N	
NE-0026	NNII BILET POST-HEATER	0.0055	LB/MMBTU	N	
NJ-0079	COMMERCIAL/INSTITUTIONAL SIZE BOILERS LESS THAN 100 MMBTU/HR	0.14	LB/H	P	USE OF NATURAL GAS
NJ-0080	BOILER LESS THAN 100 MMBTU/HR	0.27	LB/H	P	USE OF NATURAL GAS A CLEAN FUEL

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
NV-0037	AUXILIARY BOILER	0.4	LB/H	B	EFFECTIVE COMBUSTION SYSTEM DESIGN, 10:1 TURNDOWN CAPABILITY AND LOW NOX BURNER TECHNOLOGY
NV-0044	COMMERCIAL/INSTITUTIONAL-SIZE BOILERS	0.005	LB/MMBTU	P	GOOD COMBUSTION DESIGN
NV-0046	COMMERCIAL/INSTITUTIONAL BOILER	0.0052	LB/MMBTU	P	GOOD COMBUSTION PROCESS
NV-0047	BOILERS/HEATERS - NATURAL GAS-FIRED	0.0062	LB/MMBTU	P	FLUE GAS RECIRCULATION
NV-0048	COMMERCIAL/INSTITUTIONAL-SIZE BOILER (<100 MMBTU/H)	0.005	LB/MMBTU	P	GOOD COMBUSTION PRACTICE
NV-0049	BOILER - UNIT FL01	0.0054	LB/MMBTU	P	FLUE GAS RECIRCULATION
NV-0049	BOILER - UNIT BA01	0.0054	LB/MMBTU	P	FLUE GAS RECIRCULATION
NV-0049	BOILER - UNIT BA03	0.0054	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION
NV-0049	BOILER - UNIT CP01	0.0054	LB/MMBTU	P	FLUE GAS RECIRCULATION AND OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION
NV-0049	BOILER - UNIT CP03	0.0054	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION
NV-0049	BOILER - UNIT CP26	0.0054	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION
NV-0050	WATER HEATERS - UNITS NY037 AND NY038 AT NEW YORK - NEW YORK	0.0054	LB/MMBTU	P	LIMITING THE FUEL TO NATURAL GAS ONLY AND GOOD COMBUSTION PRACTICES
OH-0252	BOILERS (2)	0.49	LB/H	N	
OH-0276	BOILER FOR VACUUM OXYGEN DEGASSER VESSEL	0.15	LB/H	N	
OH-0309	BOILER (2), NATURAL GAS	0.11	LB/H	N	
OH-0323	BOILER	0.27	LB/H	N	
OK-0097	BOILERS, NATURAL GAS, STEAM GENERATORS	0.52	LB/H	P	MAINTENANCE/OPERATION PER MANUFACTURER"S SPECIFICATIONS
OK-0108	COMBUSION UNITS (ENGINE/HEATERS)	0		P	GOOD COMBUSTION DESIGN FOR THE TWO ENGINES AND BOILERS
OK-0128	LADLE PRE-HEATER AND REFRACTORY DRYING	0.0055	LB/MMBTU	P	NATURAL GAS FUEL
OK-0129	AUXILIARY BOILER	0.54	LB/H	P	GOOD COMBUSTION
OK-0129	FUEL GAS HEATER (H2O BATH)	0.1	LB/H	N	
OK-0134	NITRIC ACID PREHEATERS NO. 1 (EU 401, EUG 4)	0.11	LB/H	N	GOOD COMBUSTION
OK-0135	NITRIC ACID PREHEATERS #1, #3, AND #4	0.11	LB/H	N	
OK-0135	BOILERS #1 AND #2	0.5	LB/H	N	
PA-0262	REHEATING FURNACES (8)	0.28	LB/H	N	COMBUSTION CONTROL
PA-0262	ANNEALING FURNACES (4)	0.2	LB/H	N	

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
PA-0262	MELT SHOP	2.02	TPY	N	
SC-0111	FACE PRIMARY DRYER	0		P	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL
SC-0111	CORE PRIMARY DRYER	0		P	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL
SC-0112	VACUUM DEGASSER BOILER	0.0026	LB/MMBTU	P	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE
SC-0112	TUNNEL FURNACE BURNERS	0.0055	LB/MMBTU	P	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE
SC-0113	BOILERS	0		P	GOOD COMBUSTION PRACTICES. CONSUMPTION OF NATURAL GAS AND PROPANE AS FUEL.
SC-0114	PROPANE VAPORIZERS (ID15)	0.04	LB/H	P	TUNE-UPS AND INSPECTIONS WILL BE PERFORMED AS OUTLINED IN THE GOOD MANAGEMENT PRACTICE PLAN.
SC-0114	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	0.11	LB/H	N	
SC-0114	75 MILLION BTU/HR BACKUP THERMAL OIL HEATER	0.39	LB/H	P	GOOD COMBUSTION PRACTICES WILL BE USED AS CONTROL FOR VOC EMISSIONS
SC-0115	75 MILLION BTU/HR BACKUP THERMAL OIL HEATER	0.39	LB/H	P	GOOD COMBUSTION PRACTICES WILL BE USED AS CONTROL FOR VOC EMISSIONS.
SC-0115	PROPANE VAPORIZERS (ID 14)	0.04	LB/H	P	TUNE-UPS AND INSPECTIONS WILL BE PERFORMED AS OUTLINED IN THE GOOD MANAGEMENT PRACTICE PLAN.
SC-0115	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	0.11	LB/H	N	
TX-0501	TURBINE EXHAUST DUCT BURNER (3)	0.18	LB/H	N	
TX-0501	POWER STEAM BOILER	0.46	LB/H	N	
WI-0207	BOILER, S52/B52, 11 MMBTU/H	0.0054	LB/MMBTU	P	NATURAL GAS / PROPANE; GOOD COMBUSTION CONTROL
WI-0207	BOILER, S53 / B53, 34 MMBTU/H	0.0054	LB/MMBTU	P	NATURAL GAS / PROPANE; GOOD COMBUSTION CONTROL
WI-0207	BOILER, S50/B50, 60 MMBTU/H	0.0054	LB/MMBTU	P	NATURAL GAS / PROPANE, GOOD COMBUSTION CONTROLS
WI-0207	BOILER, S51/B51, 80 MMBTU/H	0.0054	LB/MMBTU	P	NAT. GAS / PROPANE; GOOD COMBUSTION CONTROL
WI-0223	THERMAL OIL HEATER, GTS ENERGY, S31, B31	0.18	LB/H	P	USE OF NATURAL GAS / DISTILLATE OIL, W/ RESTRICTION ON OIL USAGE
WI-0223	THERMAL OIL HEATER, GTS ENERGY, S32, B32	0.18	LB/H	P	USE OF NATURAL GAS / DISTILLATE OIL, W/ RESTRICTION ON OIL USAGE
WI-0227	NATURAL GAS FIRED AUXILLIARY BOILER	0.53	LB/H	P	NATURAL GAS FUEL, GOOD COMBUSTION PRACTICES
WI-0227	GAS HEATER (P06, S06)	0.06	LB/H	P	NATURAL GAS FUEL
WI-0228	B63, S63; B64, S64 - NATURAL GAS STATION HEATER 1 AND 2	0.004	LB/H	P	NATURAL GAS
WY-0067	HOT OIL HEATER S38	0.02	LB/MMBTU	N	GOOD COMBUSTION PRACTICES

* Control Type: **P**=Pollution Prevention/ **A**=Add-on Control Equipment/ **B**=Both/ **N**=No Controls Feasible

RBLC Search Results

VOC Emissions (Process Type: Equipment Leaks)

PROCESS CODE	RBLC ID	PROCESS	VOC EMISSIONS LIMIT	CONTROL METHOD
64.002	FL-0322	Equipment Leaks	6.52 tpy	LDAR Vva program
	TX-0575	Equipment Leaks	9.01 tpy	TX LAER LDAR program
	IA-0084	Equipment Leaks	60.9 tpy	LDAR program
	NC-0111	Recovery Equipment Leaks	----	LDAR program
		Botanical Equipment Leaks	----	LDAR program
		Rotocel Equipment Leaks	----	LDAR program
	TX-0449	Cycle Compressor Oil Vent	0.11 lb/hr	None
		Area Fugitives	4.99 lb/hr	----
	TX-0454	Fugitives	0.13 lb/hr	None
	TX-0453	Fugitives	0.20 lb/hr	None
	WI-0204	Fugitives	SOCMI	SOCMI LDAR
	TX-0457	Fugitives	0.07 lb/hr	None
	TX-0465	Fugitives	9.33 lb/hr	None
		Fugitives 4	9.08 lb/hr	None
	TX-0354	DD Area Fugitives	0.06 lb/hr	LDAR program
		Train 2 Fugitives	0.08 lb/hr	LDAR program
		MMP Area Fugitives	0.13 lb/hr	LDAR program
		Acrolein Area Fugitives	0.07 lb/hr	LDAR program
		H2S Plant Fugitives	0.01 lb/hr	LDAR program
		Train 1 Fugitives	0.05 lb/hr	LDAR program
		Dimethyl Sulfide Fugitives	0.02 lb/hr	LDAR program
		Train 1 ETSH Fugitives	0.30 lb/hr	LDAR program
	TX-0422	Equipment Leaks	----	LDAR program

RBLC Search Results

CO Emissions (Process Types 64.000, 64.003, and 64.999)

CO	RBLC ID	PROCESS	VOC EMISSIONS LIMIT	CONTROL METHOD
64.000	TX-0624	Olefins Cracking	2256 tpy	Good Engr and Combustion
64.003	ID-0017	Selexol Vent	8.7 lb/hr	Catox
	TX-0481	Rectisol Vent	11.4 lb/hr	None
		MSS Vent	21.6 lb/hr	None
	OH-0284	RTO Emissions	7.56 lb/hr	None
		TO Emissions	8.24 lb/hr	None
	TX-0354	TO Emissions-Steady state	9.56 lb/hr	None
64.999	TX-0609	Olefins Unit	146.43 tpy	Proper excess air and steam flow
	TX-0354	Incinerator	1.39 lb/hr	None

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
*IA-0106	STARTUP HEATER	0.0194	LB/MMBTU	P	GOOD OPERATING PRACTICES AND USE OF NATURAL GAS
*IA-0107	DEW POINT HEATER	0.041	LB/MMBTU	N	
*IA-0107	AUXILIARY BOILER	0.0164	LB/MMBTU	A	CO CATALYTIC OXIDIZER
*IN-0158	TWO (2) NATURAL GAS AUXILIARY BOILERS	0.083	LB/MMBTU	P	GOOD COMBUTSTION PRACTICES
*LA-0272	AMMONIA START-UP HEATER (102-B)	2.97	LB/H	P	GOOD COMBUSTION PRACTICES: PROPER DESIGN OF BURNER AND FIREBOX COMPONENTS; MAINTAINING THE PROPER AIR-TO-FUEL RATIO, RESIDENCE TIME, AND COMBUSTION ZONE TEMPERATURE.
*OH-0350	STEAM BOILER	0.04	LB/MMBTU	P	PROPER BURNER DESIGN AND GOOD COMBUSTION PRACTICES
*OH-0352	AUXILIARY BOILER	5.45	LB/H	P	GOOD COMBUSTION PRACTICES AND USING COMBUSTION OPTIMIZATION TECHNOLOGY
*OH-0355	4 INDIRECT-FIRED AIR PREHEATERS	0.15	LB/MMBTU	N	
*PA-0291	AUXILIARY BOILER	0.036	LB/MMBTU	N	
*PA-0296	AUXILIARY BOILER	3.31	TPY	N	
*SC-0149	NATURAL GAS BOILER EU004	0.039	LB/MMBTU	N	
*SC-0149	NATURAL GAS BOILER EU005	0.039	LB/MMBTU	N	
*SC-0149	NATURAL GAS BOILER EU006	0.039	LB/MMBTU	N	
AL-0230	NATURAL GAS-FIRED BATCH ANNEALING FURNACES (LA63, LA64)	0.09	LB/MMBTU	N	
AL-0230	NATURAL GAS-FIRED PASSIVE ANNEALING FURNACE (LO41)	0.09	LB/MMBTU	N	
AL-0230	3 NATURAL GAS-FIRED BOILERS WITH ULNB & EGR (537-539)	0.04	LB/MMBTU	N	
AL-0230	NATURAL GAS-FIRED BATCH ANNEALING FURNACE (535)	0.09	LB/MMBTU	N	
AL-0231	GALVANIZING LINE FURNACE	0.084	LB/MMBTU	N	
AR-0077	BOILERS	0.84	LB/MMBTU	P	GOOD COMBUSTION PRACTICE
AR-0090	PICKLE LINE BOILERS, SN-52	3.2	LB/H	P	GOOD COMBUSTION PRACTICE
AZ-0047	AUXILIARY BOILER	0.08	LB/MMBTU	N	
CA-1163	STEAM GENERATOR: OIL FIELD 5 TO < 33.5 MMBTU/HR	26	PPMVD @ 3% O2	A	LOW-NOX BURNER AND FGR
CO-0058	HEATERS	0.037	LB/MMBTU	P	GOOD COMBUSTION PRACTICES
FL-0285	ONE GASEOUS-FUELED 99 MMTU/HR AUXILIARY BOILER	0.08	LB/MMBTU	P	
FL-0286	TWO 99.8 MMBTU/H GAS-FUELED AUXILIARY BOILERS	0.08	LB/MMBTU	P	

RBLC Search Results
VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
FL-0335	FOUR (4) NATURAL GAS BOILERS - 46 MMBTU/HOUR	0.039	LB/MMBTU	P	GOOD COMBUSTION PRACTICES
IA-0088	INDIRECT-FIRED DDGS DRYER	0.1	LB/MMBTU	A	LOW NOX BURNERS AND FLUE GAS RECIRCULATION
LA-0192	FUEL GAS HEATERS (3)	1.52	LB/H	P	GOOD COMBUSTION PRACTICES
LA-0203	AUXILIARY THERMAL OIL HEATER	6.57	LB/H	P	USE OF NATURAL GAS AS FUEL AND GOOD COMBUSTION PRACTICES
LA-0240	BOILERS	0.93	LB/H	P	GOOD EQUIPMENT DESIGN AND PROPER COMBUSTION PRACTICES
LA-0246	EQT0323 - Boiler 401F	8.15	LB/H	P	PROPER DESIGN AND OPERATION, GOOD COMBUSTION PRACTICES, AND GASEOUS FUELS
MD-0035	VAPORIZATION HEATER	0.03	LB/MMBTU	P	EACH VAPORIZATION HEATER SHALL ONLY USE NATURAL GAS FOR FUEL AND SHALL USE GOOD COMBUSTION OPERATING PRACTICES
MD-0036	FUEL GAS PROCESS HEATER	143	PPMVD	P	GOOD COMBUSTION PRACTICES
MD-0040	BOILER	0.02	LB/MMBTU	N	
MD-0040	HEATER	0.08	LB/MMBTU	N	
MN-0053	BOILER, NATURAL GAS (1)	0.084	LB/MMBTU	P	GOOD COMBUSTION.
NE-0026	NNII REHEAT FURNACE	0.066	LB/MMBTU	N	
NE-0026	NNII BILET POST-HEATER	0.0084	LB/MMBTU	N	
NJ-0079	COMMERCIAL/INSTITUTIONAL SIZE BOILERS LESS THAN 100 MMBTU/HR	3.44	LB/H	P	USE OF NATURAL GAS AND GOOD COMBUSTION PRACTICES
NJ-0080	BOILER LESS THAN 100 MMBTU/HR	2.45	LB/H	P	USE OF NATURAL GAS A CLEAN FUEL
NV-0037	AUXILIARY BOILER	0.08	LB/MMBTU	P	EFFECTIVE COMBUSTION SYSTEM DESIGN, 10:1 TURNDOWN CAPABILITY, AND LNB TECHNOLOGY
NV-0044	COMMERCIAL/INSTITUTIONAL-SIZE BOILERS	0.036	LB/MMBTU	P	GOOD COMBUSTION DESIGN
NV-0046	COMMERCIAL/INSTITUTIONAL BOILER	0.083	LB/MMBTU	P	GOOD COMBUSTION PRACTICE
NV-0047	BOILERS/HEATERS - NATURAL GAS-FIRED	0.037	LB/MMBTU	P	FLUE GAS RECIRCULATION
NV-0048	COMMERCIAL/INSTITUTIONAL-SIZE BOILER (<100 MMBTU/H)	0.083	LB/MMBTU	P	GOOD COMBUSTION PRACTICE
NV-0049	BOILER - UNIT FL01	0.0705	LB/MMBTU	P	FLUE GAS RECIRCULATION
NV-0049	SMALL INTERNAL COMBUSTION ENGINE (<600 HP) - UNIT FL12	0.0067	LB/HP-H	P	THE UNIT IS EQUIPPED WITH A TURBOCHARGER.
NV-0049	BOILER - UNIT BA01	0.0173	LB/MMBTU	P	FLUE GAS RECIRCULATION
NV-0049	BOILER - UNIT BA03	0.0172	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION.
NV-0049	BOILER - UNIT CP01	0.0073	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
NV-0049	BOILER - UNIT CP03	0.0075	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION
NV-0049	BOILER - UNIT CP26	0.037	LB/MMBTU	P	OPERATING IN ACCORDANCE WITH THE MANUFACTURER'S SPECIFICATION
NV-0050	WATER HEATERS - UNITS NY037 AND NY038 AT NEW YORK - NEW YORK	0.035	LB/MMBTU	P	LIMITING THE FUEL TO NATURAL GAS ONLY AND GOOD COMBUSTION PRACTICES
OH-0252	BOILERS (2)	1.13	LB/H	N	
OH-0276	BOILER FOR VACUUM OXYGEN DEGASSER VESSEL	2.35	LB/H	N	
OH-0309	BOILER (2), NATURAL GAS	1.7	LB/H	N	
OH-0323	BOILER	4.15	LB/H	N	
OK-0128	LADLE PRE-HEATER AND REFRACTORY DRYING	0.084	LB/MMBTU	P	NATURAL GAS FUEL
OK-0129	AUXILIARY BOILER	5.02	LB/H	P	GOOD COMBUSTION
OK-0129	FUEL GAS HEATER (H2O BATH)	0.39	LB/H	N	
OK-0134	NITRIC ACID PREHEATERS NO. 1 (EU 401, EUG 4)	1.65	LB/H	P	GOOD COMBUSTION PRACTICES
OK-0134	NITRIC ACID PREHEATER NO. 3 (EU 402, EUG 4)	1.65	LB/H	P	GOOD COMBUSTION
OK-0135	NITRIC ACID PREHEATERS #1, #3, AND #4	1.65	LB/H	N	GOOD COMBUSTION PRACTICES.
OK-0135	BOILERS #1 AND #2	6.6	LB/H	N	GOOD COMBUSTION PRACTICES
PA-0262	REHEATING FURNACES (8)	8.16	LB/H	N	COMBUSTION CONTROL
PA-0262	ANNEALING FURNACES (4)	3.2	LB/H	N	
PA-0262	MELT SHOP	14.25	TPY	N	
SC-0111	FACE PRIMARY DRYER	0		P	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL
SC-0111	CORE PRIMARY DRYER	0		P	GOOD COMBUSTION PRACTICES AND NATURAL GAS AS FUEL
SC-0112	VACUUM DEGASSER BOILER	0.061	LB/MMBTU	P	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE
SC-0112	TUNNEL FURNACE BURNERS	0.084	LB/MMBTU	P	NATURAL GAS COMBUSTION WITH GOOD COMBUSTION PRACTICES PER MANUFACTURER'S GUIDANCE.
SC-0113	BOILERS	0		P	GOOD COMBUSTION PRACTICES. CONSUMPTION OF NATURAL GAS AND PROPANE.
SC-0114	PROPANE VAPORIZERS (ID15)	0.17	LB/H	P	TUNE-UPS AND INSPECTIONS WILL BE PERFORMED AS OUTLINED IN THE GOOD MANAGEMENT PRACTICE PLAN.
SC-0114	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 18)	1.67	LB/H	N	

RBLC Search Results

VOC Emissions (Process Types 13.31; Natural Gas-Fired Boilers/Furnaces < 100 MM Btu/hr)

RBLC ID	PROCESS DESCRIPTION	VOC EMISSIONS LIMIT	EMISSION LIMIT UNITS	CONTROL TYPE*	CONTROL METHOD
SC-0114	75 MILLION BTU/HR BACKUP THERMAL OIL HEATER	6	LB/H	P	POLLUTION PREVENTION OF CO EMISSIONS WILL OCCUR BY PERFORMING SCHEDULED TUNE-UPS AND INSPECTIONS AS OUTLINED IN THE GOOD MANAGEMENT PRACTICE PLAN.
SC-0115	75 MILLION BTU/HR BACKUP THERMAL OIL HEATER	6	LB/H	P	TUNE-UPS AND INSPECTIONS WILL BE PERFORMED AS OUTLINED THE GOOD MANAGEMENT PRACTICE PLAN.
SC-0115	PROPANE VAPORIZERS (ID 14)	0.17	LB/H	P	TUNE-UPS AND INSPECTIONS WILL BE PERFORMED AS OUTLINED IN THE GOOD MANAGEMENT PRACTICE PLAN.
SC-0115	NATURAL GAS SPACE HEATERS - 14 UNITS (ID 17)	1.67	LB/H	N	
TX-0501	TURBINE EXHAUST DUCT BURNER (3)	18.96	LB/H	N	
TX-0501	POWER STEAM BOILER	7.05	LB/H	N	
WI-0207	BOILER, S52/B52, 11 MMBTU/H	0.08	LB/MMBTU	P	NATURAL GAS / PROPANE ; GOOD COMBUSTION CONTROL
WI-0207	BOILER, S53 / B53, 34 MMBTU/H	0.08	LB/MMBTU	P	NATURAL GAS / PROPANE; GOOD COMBUSTION CONTROL
WI-0207	BOILER, S50/B50, 60 MMBTU/H	0.08	LB/MMBTU	P	NATURAL GAS / PROPANE; GOOD COMBUSTION CONTROL
WI-0207	BOILER, S51/B51, 80 MMBTU/H	0.08	LB/MMBTU	P	NAT. GAS / PROPANE, GOOD COMBUSTION CONTROL
WI-0223	THERMAL OIL HEATER, GTS ENERGY, S31, B31	2.7	LB/H	P	USE OF NATURAL GAS / DISTILLATE OIL, W/ RESTRICTION ON OIL USAGE
WI-0223	THERMAL OIL HEATER, GTS ENERGY, S32, B32	2.7	LB/H	P	USE OF NATURAL GAS / DISTILLATE OIL, W/ RESTRICTION ON OIL USAGE
WI-0227	NATURAL GAS FIRED AUXILLIARY BOILER	7.77	LB/H	P	NATURAL GAS FUEL, GOOD COMBUSTION PRACTICES
WI-0227	GAS HEATER (P06, S06)	0.47	LB/H	P	NATURAL GAS FUEL
WI-0228	B63, S63; B64, S64 - NATURAL GAS STATION HEATER 1 AND 2	0.06	LB/H	P	NATURAL GAS
WY-0067	HOT OIL HEATER S38	0.02	LB/MMBTU	N	GOOD COMBUSTION PRACTICES

* Control Type: **P**=Pollution Prevention/ **A**=Add-on Control Equipment/ **B**=Both/ **N**=No Controls Feasible

Appendix D
BACT Analysis Cost Information

BP Cooper River

COMMON COST VALUES FOR BACT ANALYSIS

COST DESCRIPTION	COST		BASIS FOR COST
Operations and Maintenance Labor	45	$/hr	BP CR With Benefits
Natural Gas Cost	3.44	$/1,000 cf	BP CR
Electricity Cost	0.058	$/kW-hr	BP CR
Potable Water	2.67	$/1,000 gal	BP CR
Steam	5.80	$/1000 lb	BP CR
Nitrogen	1.625	$/1000 SCF	BP CR
Wastewater Treatment	3.30	$/1,000 gal	BP CR
Solid Waste Disposal	104.0	$/ton	BP CR
Liquid Waste Disposal	0.15	$/lb	BP CR
Caustic	0.31	$/lb	BP CR
Carbon	1.00	$/lb	Vendor Quotes for BP facility
Capital Recovery Factor (8% and 20 year life)	0.10185		USEPA Financial References
Site Preparation	150,000		
Facilities and Buildings	25,000		

LPA VOC COST TABLES

LPA THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (Input Cost: QAQPS USEPA Factors)		$255,000	
Ancillary Equipment		$38,250	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$327,750*
Instrumentation (0.10 * A)		$32,775	
Sales Taxes (0.03 * A)		$9,833	
Freight (0.05 * A)		$16,388	
	Purchased Equipment Cost = "B" =		*$386,745*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$30,940	
Handling and Errection (0.14 * B)		$54,144	
Electrical (0.04 * B)		$15,470	
Piping, Ductwork, and Installation (0.02 *B)		$7,735	
Insulation for Ductwork (0.01 * B)		$3,867	
Painting (0.01 * B)		$3,867	
	Direct Installation Cost =		*$116,024*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$677,769*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$38,675	
Construction and Field Expenses (0.05 *B)		$19,337	
Contractor Fees (0.10 *B)		$38,675	
Start-Up (0.02 *B)		$7,735	
Performance Test (0.01 *B)		$3,867	
Contingencies (0.03 * B)		$11,602	
	Total Indirect Cost =		*$119,891*
TOTAL CAPITAL INVESTMENT =			**$797,659**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$32,850
Supervisor	= (15% of Operator Cost)		$4,928
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$5,475
Maintenance Materials	= 100% of Maintenance Labor		$5,475
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	182.0	$329,068
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	40.5	$15,345
		Total DC =	*$393,140*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$48,728	$29,237
Administrative	= 2% of Total Capital Investment		$15,953
Property Tax	= 1% of Total Capital Investment		$7,977
Insurance	= 1% of Total Capital Investment		$7,977
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$81,242
		Total IC =	*$142,384*
TOTAL ANNUAL OPERATING COSTS =			**$535,524**

LPA CATALYTIC THERMAL OXIDIZER (New)

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$ 417,000	
Ancillary Equipment		$62,550	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$ 514,050.00*
Instrumentation (0.10 * A)		$51,405	
Sales Taxes (0.03 * A)		$15,422	
Freight (0.05 * A)		$25,703	
	Purchased Equipment Cost = "B" =		*$606,579*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$48,526	
Handling and Errection (0.14 * B)		$84,921	
Electrical (0.04 * B)		$24,263	
Piping, Ductwork, and Installation (0.02 *B)		$12,132	
Insulation for Ductwork (0.01 * B)		$6,066	
Painting (0.01 * B)		$6,066	
	Direct Installation Cost =		*$181,974*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$963,553*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$60,658	
Construction and Field Expenses (0.05 *B)		$30,329	
Contractor Fees (0.10 *B)		$60,658	
Start-Up (0.02 *B)		$12,132	
Performance Test (0.01 *B)		$6,066	
Contingencies (0.03 * B)		$18,197	
	Total Indirect Cost =		*$188,039*
	TOTAL CAPITAL INVESTMENT =		**$1,151,592**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Supervisor	= (15% of Operator Cost)		$2,190
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Maintenance Materials	= 100% of Maintenance Labor		$14,600
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	50	$6,071
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	65.0	$117,524
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	40.5	$15,345
		Total DC =	*$184,930*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$45,990	$27,594
Administrative	= 2% of Total Capital Investment		$23,032
Property Tax	= 1% of Total Capital Investment		$11,516
Insurance	= 1% of Total Capital Investment		$11,516
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$117,290
		Total IC =	*$190,947*
	TOTAL ANNUAL OPERATING COSTS =		**$375,878**

LPA TO EXISTING CATALYTIC THERMAL OXIDIZER ON HPA

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Existing Unit			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$0	
Ancillary Equipment		$0	
Compressor		$300,000	
Ancillary Equipment		$45,000	
		Sum = "A" =	*$345,000*
Instrumentation (0.10 * A)		$34,500	
Sales Taxes (0.03 * A)		$10,350	
Freight (0.05 * A)		$17,250	
	Purchased Equipment Cost = "B" =		*$407,100*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$32,568	
Handling and Errection (0.14 * B)		$56,994	
Electrical (0.04 * B)		$16,284	
Piping, Ductwork, and Installation (0.02 *B)		$8,142	
Insulation for Ductwork (0.01 * B)		$4,071	
Painting (0.01 * B)		$4,071	
	Direct Installation Cost =		*$122,130*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$704,230*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$40,710	
Construction and Field Expenses (0.05 *B)		$20,355	
Contractor Fees (0.10 *B)		$40,710	
Start-Up (0.02 *B)		$8,142	
Performance Test (0.01 *B)		$4,071	
Contingencies (0.03 * B)		$12,213	
	Total Indirect Cost =		*$126,201*
	TOTAL CAPITAL INVESTMENT =		**$830,431**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	3	$98,550
Maintenance Materials	= 100% of Maintenance Labor		$98,550
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	478	$58,043
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	65.0	$117,524
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	1341.0	$508,080
		Total DC =	*$899,636*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$215,989	$129,593
Administrative	= 2% of Total Capital Investment		$16,609
Property Tax	= 1% of Total Capital Investment		$8,304
Insurance	= 1% of Total Capital Investment		$8,304
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$0
		Total IC =	*$162,810*
	TOTAL ANNUAL OPERATING COSTS =		**$1,062,446**

LPA REGENERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		480,000	
Ancillary Equipment		$72,000	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*586,500*
Instrumentation (0.10 * A)		$58,650	
Sales Taxes (0.03 * A)		$17,595	
Freight (0.05 * A)		$29,325	
	Purchased Equipment Cost = "B" =		*$692,070*
Direest Installation Costs			
Foundation and Supports (0.08 * B)		$55,366	
Handling and Errection (0.14 * B)		$96,890	
Electrical (0.04 * B)		$27,683	
Piping, Ductwork, and Installation (0.02 *B)		$13,841	
Insulation for Ductwork (0.01 * B)		$6,921	
Painting (0.01 * B)		$6,921	
	Direct Installation Cost =		*$207,621*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,074,691*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$69,207	
Construction and Field Expenses (0.05 *B)		$34,604	
Contractor Fees (0.10 *B)		$69,207	
Start-Up (0.02 *B)		$13,841	
Performance Test (0.01 *B)		$6,921	
Contingencies (0.03 * B)		$20,762	
	Total Indirect Cost =		*$214,542*
	TOTAL CAPITAL INVESTMENT =		**$1,289,233**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	91.0	$164,534
Electricity	= $/kWhr* kWhr *8760 hr/yr	48.0	$24,388
Media Replacement	= CF media * $50/CF / 2 years	400.0	$10,000
		Total DC =	*$250,660*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$25,785
Property Tax	= 1% of Total Capital Investment		$12,892
Insurance	= 1% of Total Capital Investment		$12,892
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$131,308
		Total IC =	*$213,921*
	TOTAL ANNUAL OPERATING COSTS =		**$464,581**

LPA RECUPERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$600,000	
Ancillary Equipment		$90,000	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$724,500*
Instrumentation (0.10 * A)		$72,450	
Sales Taxes (0.03 * A)		$21,735	
Freight (0.05 * A)		$36,225	
	Purchased Equipment Cost = "B" =		*$854,910*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$68,393	
Handling and Errection (0.14 * B)		$119,687	
Electrical (0.04 * B)		$34,196	
Piping, Ductwork, and Installation (0.02 *B)		$17,098	
Insulation for Ductwork (0.01 * B)		$8,549	
Painting (0.01 * B)		$8,549	
	Direct Installation Cost =		*$256,473*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,286,383*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$85,491	
Construction and Field Expenses (0.05 *B)		$42,746	
Contractor Fees (0.10 *B)		$85,491	
Start-Up (0.02 *B)		$17,098	
Performance Test (0.01 *B)		$8,549	
Contingencies (0.03 * B)		$25,647	
	Total Indirect Cost =		*$265,022*
	TOTAL CAPITAL INVESTMENT =		**$1,551,405**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	45.5	$82,267
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	40.0	$15,155
		Total DC =	*$149,161*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$31,028
Property Tax	= 1% of Total Capital Investment		$15,514
Insurance	= 1% of Total Capital Investment		$15,514
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$258,367
		Total IC =	*$351,466*
	TOTAL ANNUAL OPERATING COSTS =		**$500,627**

LPA WET SCRUBBER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Scrubber			
Scrubber (User Input Cost: QAQPS USEPA Factors)		$120,000	
Ancillary Equipment		$18,000	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$172,500*
Instrumentation (0.10 * A)		$15,525	
Sales Taxes (0.03 * A)		$8,625	
Freight (0.05 * A)		$13,800	
	Purchased Equipment Cost = "B" =		*$210,450*
Direst Installation Costs			
Foundation and Supports (0.12 * B)		$25,254	
Handling and Errection (0.40 * B)		$84,180	
Electrical (0.01 * B)		$2,105	
Piping, Ductwork, and Installation (0.30 *B)		$63,135	
Insulation (0.01 * B)		$2,105	
Painting (0.01 * B)		$2,105	
	Direct Installation Cost =		*$178,883*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$564,333*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$21,045	
Construction and Field Expenses (0.10 *B)		$21,045	
Contractor Fees (0.10 *B)		$21,045	
Start-Up (0.01 *B)		$2,105	
Performance Test (0.01 *B)		$2,105	
Contingencies (0.03 * B)		$6,314	
	Total Indirect Cost =		*$73,658*
	TOTAL CAPITAL INVESTMENT =		**$637,990**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	10	$3,789
Water	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	38	$53,327
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	40	$69,379
Caustic	=lb/hr * $/lb * 8760 hr/yr	46.3	$125,597
		Total DC =	*$303,831*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$12,760
Property Tax	= 1% of Total Capital Investment		$6,380
Insurance	= 1% of Total Capital Investment		$6,380
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$64,979
		Total IC =	*$121,542*
	TOTAL ANNUAL OPERATING COSTS =		**$425,373**

LPA CARBON ADSORPTION/THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Carbon Adsorber and Thermal Oxidizer			
Adsorber (User Input Cost: OAQPS Info)		$190,000	
Ancillary Equipment		$47,500	
Thermal Oxidizer (Input Cost: OAQPS USEPA Factor)		$195,000	
Ancillary Equipment		$29,250	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$496,250*
Instrumentation (0.10 * A)		$49,625	
Sales Taxes (0.03 * A)		$14,888	
Freight (0.05 * A)		$24,813	
	Purchased Equipment Cost = "B" =		*$585,575*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$46,846	
Handling and Erection (0.14 * B)		$81,981	
Electrical (0.04 * B)		$23,423	
Piping, Ductwork, and Installation (0.02 *B)		$11,712	
Insulation for Ductwork (0.01 * B)		$5,856	
Painting (0.02 * B)		$11,712	
	Direct Installation Cost =		*$181,528*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$942,103*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$58,558	
Construction and Field Expenses (0.05 *B)		$29,279	
Contractor Fees (0.10 *B)		$58,558	
Start-Up (0.02 *B)		$11,712	
Performance Test (0.01 *B)		$5,856	
Contingencies (0.03 * B)		$17,567	
	Total Indirect Cost =		*$181,528*
	TOTAL CAPITAL INVESTMENT =		**$1,123,632**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Carbon Replacement Labor	(Estimated hours x labor cost)	32	$1,440
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Replacement Carbon		220,752	$220,752
Solid waste disposal	= $/ton * lbs/yr/2000	110	$11,479
Steam	=4.0 lbs steam/lb Organic adsorbed * $/lb	331128	$7,682
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	3.0	$5,424
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	4.5	$1,705
		Total DC =	*$300,221*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$53,179	$31,907
Administrative	= 2% of Total Capital Investment		$22,473
Property Tax	= 1% of Total Capital Investment		$11,236
Insurance	= 1% of Total Capital Investment		$11,236
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$114,442
		Total IC =	*$191,294*
	TOTAL ANNUAL OPERATING COSTS =		**$491,516**

LPA BIOFILTRATION

BASIS: EPA-456/R-03-003 September 2003/OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Biofiltration (User Input Cost: USEPA standard cost per cfm Info)		$484,500	
Ancillary Equipment		$48,450	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$567,450*
Instrumentation (0.10 * A)		$56,745	
Sales Taxes (0.03 * A)		$17,024	
Freight (0.05 * A)		$28,373	
	Purchased Equipment Cost = "B" =		*$669,591*
Direst Installation Costs			
Foundation & Supports (0.02 * B)		$13,392	
Handling & Errection (0.04 * B)		$26,784	
Electrical (0.04 * B)		$26,784	
Piping & Ductwork Installation (0.04 *B)		$26,784	
Insulation for Ductwork (0.01 * B)		$6,696	
Painting (0.00 * B)		$0	
	Direct Installation Cost =		*$100,439*
Site Preparation (User Inputs Actual Cost)		$50,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$845,030*
Indirect Cost (Installation)			
Engineering (0.05 * B)		$33,480	
Construction & Field Expenses (0.02 *B)		$13,392	
Contractor Fees (0.10 *B)		$66,959	
Start-Up (0.02 *B)		$13,392	
Performance Test (0.01 *B)		$6,696	
Contingencies (0.03 * B)		$20,088	
	Total Indirect Cost =		*$154,006*
TOTAL CAPITAL INVESTMENT =			**$999,036**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.20	$6,570
Maintenance Materials	= 100% of Maintenance Labor		$6,570
Bed Replacement Labor	= 2 people x 8 hr/day x 2 days x 2 per year x $/hr	64	$2,880
Bed Media Cost	= cuyd x 2 x $50/cu yd	33	$3,300
Utilities:			
Humidifacation Water	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	4	$5,613
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	20	$7,578
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	5	$8,672
		Total DC =	*$60,072*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$38,209	$22,925
Administrative	= 2% of Total Capital Investment		$19,981
Property Tax	= 1% of Total Capital Investment		$9,990
Insurance	= 1% of Total Capital Investment		$9,990
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$101,752
		Total IC =	*$164,638*
TOTAL ANNUAL OPERATING COSTS =			**$224,711**

LPA REFRIGERATED CONDENSER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Refrigerated Condenser			
Condenser (User Input Cost: OAQPS Info)		$106,000	
Ancillary Equipment		$26,500	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$167,000*
Instrumentation (0.10 * A)		$16,700	
Sales Taxes (0.03 * A)		$5,010	
Freight (0.05 * A)		$8,350	
	Purchased Equipment Cost = "B" =		*$197,060*
Direst Installation Costs			
Foundation & Supports (0.08 * B)		$15,765	
Handling & Errection (0.14 * B)		$27,588	
Electrical (0.04 * B)		$7,882	
Piping, Ductwork & Installation (0.02 *B)		$3,941	
Insulation for Ductwork (0.01 * B)		$1,971	
Painting (0.02 * B)		$3,941	
	Direct Installation Cost =		*$61,089*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$433,149*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$19,706	
Construction & Field Expenses (0.05 *B)		$9,853	
Contractor Fees (0.10 *B)		$19,706	
Start-Up (0.02 *B)		$3,941	
Performance Test (0.01 *B)		$1,971	
Contingencies (0.03 * B)		$5,912	
	Total Indirect Cost =		*$61,089*
	TOTAL CAPITAL INVESTMENT =		**$494,237**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Parts Cost	(5% of Purchased Cost)		$8,350
Utilities:			
Liquid Waste Disposal	= $/lb * lb/hr * 8760 hr/yr	140	$183,960
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	45	$17,050
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1	$1,734
		Total DC =	*$261,098*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$60,089	$36,053
Administrative	= 2% of Total Capital Investment		$9,885
Property Tax	= 1% of Total Capital Investment		$4,942
Insurance	= 1% of Total Capital Investment		$4,942
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$50,338
		Total IC =	*$106,161*
	TOTAL ANNUAL OPERATING COSTS =		**$367,259**

LPA FLARE

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Flare (User Input Cost: OAQPS Info)		$ 323,000	
Knock Out Drum (User Input Cost: OAQPS Info)		$ 19,800	
Fan		$ 25,000	
Ancillary Equipment		$ 3,750	
		Sum = "A" =	*$ 371,550*
Instrumentation (0.10 * A)		$37,155	
Sales Taxes (0.03 * A)		$11,147	
Freight (0.05 * A)		$18,578	
	Purchased Equipment Cost = "B" =		*$438,429*
Direct Installation Costs			
Foundation & Supports (0.08 * B)		$35,074	
Handling & Errection (0.14 * B)		$61,380	
Electrical (0.04 * B)		$17,537	
Piping, Ductwork & Installation (0.02 *B)		$8,769	
Insulation for Ductwork (0.01 * B)		$4,384	
Painting (0.02 * B)		$8,769	
	Direct Installation Cost =		*$135,913*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$749,342*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$43,843	
Construction & Field Expenses (0.05 *B)		$21,921	
Contractor Fees (0.10 *B)		$43,843	
Start-Up (0.02 *B)		$8,769	
Performance Test (0.01 *B)		$4,384	
Contingencies (0.03 * B)		$13,153	
	Total Indirect Cost =		*$135,913*
TOTAL CAPITAL INVESTMENT =			**$885,255**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= 200 hr/yr	200.00	$9,000
Supervisor	= (15% of Operator Cost)		$1,350
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	45	$17,050
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1	$1,734
Fuel	= $/1000 cf * scf/min * 60 min * 8760 hr.yr	1500	$2,712,096
		Total DC =	*$2,774,080*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$43,200	$25,920
Administrative	= 2% of Total Capital Investment		$17,705
Property Tax	= 1% of Total Capital Investment		$8,853
Insurance	= 1% of Total Capital Investment		$8,853
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$90,163
		Total IC =	*$151,493*
TOTAL ANNUAL OPERATING COSTS =			**$2,925,574**

HPA VOC COST TABLES

HPA THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (Input Cost: QAQPS USEPA Factor)		$533,000	
Ancillary Equipment		$79,950	N/A
		Sum = "A" =	*$612,950*
Instrumentation (0.10 * A)		$61,295	
Sales Taxes (0.03 * A)		$18,389	
Freight (0.05 * A)		$30,648	
	Purchased Equipment Cost = "B" =		*$723,281*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$57,862	
Handling and Errection (0.14 * B)		$101,259	
Electrical (0.04 * B)		$28,931	
Piping, Ductwork, and Installation (0.02 *B)		$14,466	
Insulation for Ductwork (0.01 * B)		$7,233	
Painting (0.01 * B)		$7,233	
	Direct Installation Cost =		*$216,984*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,115,265*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$72,328	
Construction and Field Expenses (0.05 *B)		$36,164	
Contractor Fees (0.10 *B)		$72,328	
Start-Up (0.02 *B)		$14,466	
Performance Test (0.01 *B)		$7,233	
Contingencies (0.03 * B)		$21,698	
	Total Indirect Cost =		*$224,217*
TOTAL CAPITAL INVESTMENT =			**$1,339,482**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	6425.9	$11,618,422
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	127.0	$48,125
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
		Total DC =	*$28,800,286*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$26,790
Property Tax	= 1% of Total Capital Investment		$13,395
Insurance	= 1% of Total Capital Investment		$13,395
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$136,426
		Total IC =	*$221,049*
TOTAL ANNUAL OPERATING COSTS =			**$29,021,335**

HPA EXISTING CATALYTIC THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM			COST	TOTALS
Direct Costs				
Existing Unit No construction necessary				
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)			$ -	
Ancillary Equipment			$0	N/A
			Sum = "A" =	*$0*
Instrumentation (0.10 * A)			$0	
Sales Taxes (0.03 * A)			$0	
Freight (0.05 * A)			$0	
	Purchased Equipment Cost = "B" =			*$0*
Direst Installation Costs				
Foundation and Supports (0.08 * B)			$0	
Handling and Errection (0.14 * B)			$0	
Electrical (0.04 * B)			$0	
Piping, Ductwork, and Installation (0.02 *B)			$0	
Insulation for Ductwork (0.01 * B)			$0	
Painting (0.01 * B)			$0	
	Direct Installation Cost =			*$0*
Site Preparation (User Inputs Actual Cost)			$0	
Facilities and Buildings (User Inputs Actual Cost)			$0	
	Total Direct Cost =			*$0*
Indirect Cost (Installation)				
Engineering (0.10 * B)			$0	
Construction and Field Expenses (0.05 *B)			$0	
Contractor Fees (0.10 *B)			$0	
Start-Up (0.02 *B)			$0	
Performance Test (0.01 *B)			$0	
Contingencies (0.03 * B)			$0	
	Total Indirect Cost =			*$0*
TOTAL CAPITAL INVESTMENT =				**$0**
Direct Annual Costs (DC)				
Operating Labor	***(Basis of Calculations)***			
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5		$16,425
Supervisor	= (15% of Operator Cost)			$2,464
Operating Materials	(If Any)			$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5		$16,425
Maintenance Materials	= 100% of Maintenance Labor			$16,425
Replacement Labor	N/A			$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	478		$58,043
Utilities:				
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	196.1		$354,522
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	15.0		$5,683
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	15		$26,017
Sodium Formate	=lb/hr * $/lb * 8760 hr/yr	15.0		$40,734
		Total DC =		*$536,738*
Indirect Annual Costs (IC)				
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739		$31,043
Administrative	= 2% of Total Capital Investment			$0
Property Tax	= 1% of Total Capital Investment			$0
Insurance	= 1% of Total Capital Investment			$0
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)			$0
		Total IC =		*$31,043*
TOTAL ANNUAL OPERATING COSTS =				**$567,782**

HPA REGENERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		1,056,200	
Ancillary Equipment		$158,430	
		Sum = "A" =	*1,214,630*
Instrumentation (0.10 * A)		$121,463	
Sales Taxes (0.03 * A)		$36,439	
Freight (0.05 * A)		$60,732	
	Purchased Equipment Cost = "B" =		*$1,433,263*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$114,661	
Handling and Errection (0.14 * B)		$200,657	
Electrical (0.04 * B)		$57,331	
Piping, Ductwork, and Installation (0.02 *B)		$28,665	
Insulation for Ductwork (0.01 * B)		$14,333	
Painting (0.01 * B)		$14,333	
	Direct Installation Cost =		*$429,979*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$2,038,242*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$143,326	
Construction and Field Expenses (0.05 *B)		$71,663	
Contractor Fees (0.10 *B)		$143,326	
Start-Up (0.02 *B)		$28,665	
Performance Test (0.01 *B)		$14,333	
Contingencies (0.03 * B)		$42,998	
	Total Indirect Cost =		*$444,312*
	TOTAL CAPITAL INVESTMENT =		**$2,482,554**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	642.6	$1,161,842
Electricity	= $/kWhr* kWhr *8760 hr/yr	395.0	$200,692
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
Media Replacement	= CF media * $50/CF / 3 years	10000.0	$166,667
		Total DC =	*$18,662,939*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$49,651
Property Tax	= 1% of Total Capital Investment		$24,826
Insurance	= 1% of Total Capital Investment		$24,826
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$418,691
		Total IC =	*$549,037*
	TOTAL ANNUAL OPERATING COSTS =		**$19,211,976**

HPA RECUPERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS UEPA Factor)		$896,500	
Ancillary Equipment		$134,475	
		Sum = "A" =	*$1,030,975*
Instrumentation (0.10 * A)		$103,098	
Sales Taxes (0.03 * A)		$30,929	
Freight (0.05 * A)		$51,549	
	Purchased Equipment Cost = "B" =		*$1,216,551*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$97,324	
Handling and Errection (0.14 * B)		$170,317	
Electrical (0.04 * B)		$48,662	
Piping, Ductwork, and Installation (0.02 *B)		$24,331	
Insulation for Ductwork (0.01 * B)		$12,166	
Painting (0.01 * B)		$12,166	
	Direct Installation Cost =		*$364,965*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,756,516*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$121,655	
Construction and Field Expenses (0.05 *B)		$60,828	
Contractor Fees (0.10 *B)		$121,655	
Start-Up (0.02 *B)		$24,331	
Performance Test (0.01 *B)		$12,166	
Contingencies (0.03 * B)		$36,497	
	Total Indirect Cost =		*$377,131*
	TOTAL CAPITAL INVESTMENT =		**$2,133,646**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	3212.9	$5,809,211
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	301.7	$114,297
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
		Total DC =	*$23,057,247*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$42,673
Property Tax	= 1% of Total Capital Investment		$21,336
Insurance	= 1% of Total Capital Investment		$21,336
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$258,367
		Total IC =	*$374,756*
	TOTAL ANNUAL OPERATING COSTS =		**$23,432,003**

HPA WET SCRUBBER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Scrubber			
Scrubber (User Input Cost: OAQPS factor)		$340,500	
Ancillary Equipment		$51,075	
		Sum = "A" =	*$391,575*
Instrumentation (0.10 * A)		$35,242	
Sales Taxes (0.03 * A)		$19,579	
Freight (0.05 * A)		$31,326	
	Purchased Equipment Cost = "B" =		*$477,722*
Direst Installation Costs			
Foundation and Supports (0.12 * B)		$57,327	
Handling and Errection (0.40 * B)		$191,089	
Electrical (0.01 * B)		$4,777	
Piping, Ductwork, and Installation (0.30 *B)		$143,316	
Insulation (0.01 * B)		$4,777	
Painting (0.01 * B)		$4,777	
	Direct Installation Cost =		*$406,063*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,058,785*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$47,772	
Construction and Field Expenses (0.10 *B)		$47,772	
Contractor Fees (0.10 *B)		$47,772	
Start-Up (0.01 *B)		$4,777	
Performance Test (0.01 *B)		$4,777	
Contingencies (0.03 * B)		$14,332	
	Total Indirect Cost =		*$167,203*
	TOTAL CAPITAL INVESTMENT =		**$1,225,987**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	130	$49,114
Water	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	93	$129,940
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	93	$160,600
Caustic	=lb/hr caustic * $/lb*8760	433	$1,175,695
		Total DC =	*$1,567,088*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$24,520
Property Tax	= 1% of Total Capital Investment		$12,260
Insurance	= 1% of Total Capital Investment		$12,260
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$124,867
		Total IC =	*$204,950*
	TOTAL ANNUAL OPERATING COSTS =		**$1,772,038**

HPA BIOFILTRATION

BASIS: EPA-456/R-03-003 September 2003/OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Bioflitration			
Biofiltration (User Input Cost: USEPA standard cost per cfm Info)		$382,350	
Ancillary Equipment		$38,235	N/A
		Sum = "A" =	*$420,585*
Instrumentation (0.10 * A)		$42,059	
Sales Taxes (0.03 * A)		$12,618	
Freight (0.05 * A)		$21,029	
	Purchased Equipment Cost = "B" =		*$496,290*
Direst Installation Costs			
Foundation & Supports (0.02 * B)		$9,926	
Handling & Errection (0.04 * B)		$19,852	
Electrical (0.04 * B)		$19,852	
Piping & Ductwork Installation (0.04 *B)		$19,852	
Insulation for Ductwork (0.01 * B)		$4,963	
Painting (0.00 * B)		$0	
	Direct Installation Cost =		*$74,444*
Site Preparation (User Inputs Actual Cost)		$50,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$645,734*
Indirect Cost (Installation)			
Engineering (0.05 * B)		$24,815	
Construction & Field Expenses (0.02 *B)		$9,926	
Contractor Fees (0.10 *B)		$49,629	
Start-Up (0.02 *B)		$9,926	
Performance Test (0.01 *B)		$4,963	
Contingencies (0.03 * B)		$14,889	
	Total Indirect Cost =		*$114,147*
	TOTAL CAPITAL INVESTMENT =		**$759,881**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.20	$6,570
Maintenance Materials	= 100% of Maintenance Labor		$6,570
Bed Replacement Labor	= 2 people x 8 hr/day x 3 days x 2 per year x $/hr	96	$4,320
Bed Media Cost	= cuyd x 2 x $50/cu yd	1412	$141,200
Utilities:			
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
Humidifacation Water	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	4	$5,613
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	20	$7,578
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	5	$8,672
		Total DC =	*$17,281,412*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$177,549	$106,529
Administrative	= 2% of Total Capital Investment		$15,198
Property Tax	= 1% of Total Capital Investment		$7,599
Insurance	= 1% of Total Capital Investment		$7,599
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$77,394
		Total IC =	*$214,318*
	TOTAL ANNUAL OPERATING COSTS =		**$17,495,731**

HPA CARBON ADSORPTION/THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Carbon Adsorber			
Adsorber (User Input Cost: QAQPS Info)		$375,000	
Ancillary Equipment		$93,750	
Thermal oxidizer		$435,000	
Ancillary Equipment		$108,750	
		Sum = "A" =	*$1,012,500*
Instrumentation (0.10 * A)		$101,250	
Sales Taxes (0.03 * A)		$30,375	
Freight (0.05 * A)		$50,625	
	Purchased Equipment Cost = "B" =		*$1,194,750*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$95,580	
Handling and Errection (0.14 * B)		$167,265	
Electrical (0.04 * B)		$47,790	
Piping, Ductwork, and Installation (0.02 *B)		$23,895	
Insulation for Ductwork (0.01 * B)		$11,948	
Painting (0.02 * B)		$23,895	
	Direct Installation Cost =		*$370,373*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,740,123*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$119,475	
Construction and Field Expenses (0.05 *B)		$59,738	
Contractor Fees (0.10 *B)		$119,475	
Start-Up (0.02 *B)		$23,895	
Performance Test (0.01 *B)		$11,948	
Contingencies (0.03 * B)		$35,843	
	Total Indirect Cost =		*$370,373*
	TOTAL CAPITAL INVESTMENT =		**$2,110,495**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Replacement Carbon		3,416,400	$3,416,400
Solid waste disposal	= $/ton * lbs/yr/2000	1708	$177,653
Steam	=4.0 lbs steam/lb Organic adsorbed * $/lb	5,124,600	$118,891
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	580.0	$1,048,677
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	45	$293,960
		Total DC =	*$5,107,319*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$42,210
Property Tax	= 1% of Total Capital Investment		$21,105
Insurance	= 1% of Total Capital Investment		$21,105
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$214,954
		Total IC =	*$330,417*
	TOTAL ANNUAL OPERATING COSTS =		**$5,437,736**

HPA REFRIGERATED CONDENSER SYSTEM

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Refrigerated Condenser System			
Condenser (User Input Cost: QAQPS Info)		$320,000	
Ancillary Equipment		$80,000	
		Sum = "A" =	*$400,000*
Instrumentation (0.10 * A)		$40,000	
Sales Taxes (0.03 * A)		$12,000	
Freight (0.05 * A)		$20,000	
	Purchased Equipment Cost = "B" =		*$472,000*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$37,760	
Handling and Errection (0.14 * B)		$66,080	
Electrical (0.04 * B)		$18,880	
Piping, Ductwork, and Installation (0.02 *B)		$9,440	
Insulation for Ductwork (0.01 * B)		$4,720	
Painting (0.02 * B)		$9,440	
	Direct Installation Cost =		*$146,320*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$793,320*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$47,200	
Construction and Field Expenses (0.05 *B)		$23,600	
Contractor Fees (0.10 *B)		$47,200	
Start-Up (0.02 *B)		$9,440	
Performance Test (0.01 *B)		$4,720	
Contingencies (0.03 * B)		$14,160	
	Total Indirect Cost =		*$146,320*
TOTAL CAPITAL INVESTMENT =			**$939,640**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Wastewater	= $/1000 gal * gal/hr * 8760 hr/yr	600	$17,345
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	100	$37,888
		Total DC =	*$106,972*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$18,793
Property Tax	= 1% of Total Capital Investment		$9,396
Insurance	= 1% of Total Capital Investment		$9,396
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$95,702
		Total IC =	*$164,331*
TOTAL ANNUAL OPERATING COSTS =			**$271,303**

HPA FLARE

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Flare (User Input Cost: OAQPS Info)		$ 208,450	
Steam Vent		$ 6,350	
Knock Out Drum		$ 1,500	
		Sum = "A" =	*$ 216,300*
Instrumentation (0.10 * A)		$21,630	
Sales Taxes (0.03 * A)		$6,489	
Freight (0.05 * A)		$10,815	
	Purchased Equipment Cost = "B" =		*$255,234*
Direct Installation Costs			
Foundation & Supports (0.08 * B)		$20,419	
Handling & Errection (0.14 * B)		$35,733	
Electrical (0.04 * B)		$10,209	
Piping, Ductwork & Installation (0.02 *B)		$5,105	
Insulation for Ductwork (0.01 * B)		$2,552	
Painting (0.02 * B)		$5,105	
	Direct Installation Cost =		*$79,123*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$509,357*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$25,523	
Construction & Field Expenses (0.05 *B)		$12,762	
Contractor Fees (0.10 *B)		$25,523	
Start-Up (0.02 *B)		$5,105	
Performance Test (0.01 *B)		$2,552	
Contingencies (0.03 * B)		$7,657	
	Total Indirect Cost =		*$79,123*
TOTAL CAPITAL INVESTMENT =			**$588,479**

Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= 630 hr/yr	630.00	$28,350
Supervisor	= (15% of Operator Cost)		$4,253
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	45	$17,050
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1	$1,734
Fuel	= $/1000 cf * scf/min * 60 min * 8760 hr.yr	1137	$2,055,769
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
		Total DC =	*$19,222,005*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$65,453	$39,272
Administrative	= 2% of Total Capital Investment		$11,770
Property Tax	= 1% of Total Capital Investment		$5,885
Insurance	= 1% of Total Capital Investment		$5,885
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$59,937
		Total IC =	*$122,747*
TOTAL ANNUAL OPERATING COSTS =			**$19,344,753**

Carrier Gas Addition - Nitrogen

Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20,000	**$17,082,000**

VENT SCRUBBER VOC COST TABLES

VENT SCRUBBER THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (Input Cost: QAQPS USEPA Factor)		$225,000	
Ancillary Equipment		$33,750	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$293,250*
Instrumentation (0.10 * A)		$29,325	
Sales Taxes (0.03 * A)		$8,798	
Freight (0.05 * A)		$14,663	
	Purchased Equipment Cost = "B" =		*$346,035*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$27,683	
Handling and Errection (0.14 * B)		$48,445	
Electrical (0.04 * B)		$13,841	
Piping, Ductwork, and Installation (0.02 *B)		$6,921	
Insulation for Ductwork (0.01 * B)		$3,460	
Painting (0.01 * B)		$3,460	
	Direct Installation Cost =		*$103,811*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$624,846*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$34,604	
Construction and Field Expenses (0.05 *B)		$17,302	
Contractor Fees (0.10 *B)		$34,604	
Start-Up (0.02 *B)		$6,921	
Performance Test (0.01 *B)		$3,460	
Contingencies (0.03 * B)		$10,381	
	Total Indirect Cost =		*$107,271*
TOTAL CAPITAL INVESTMENT =			**$732,116**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	775.0	$1,401,250
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	50	$18,944
		Total DC =	*$1,471,932*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$14,642
Property Tax	= 1% of Total Capital Investment		$7,321
Insurance	= 1% of Total Capital Investment		$7,321
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$74,566
		Total IC =	*$134,894*
TOTAL ANNUAL OPERATING COSTS =			**$1,606,826**

VENT SCRUBBER CATALYTIC THERMAL OXIDIZER (New)

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$ 585,000	
Ancillary Equipment		$87,750	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$ 707,250.00*
Instrumentation (0.10 * A)		$70,725	
Sales Taxes (0.03 * A)		$21,218	
Freight (0.05 * A)		$35,363	
	Purchased Equipment Cost = "B" =		*$834,555*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$66,764	
Handling and Errection (0.14 * B)		$116,838	
Electrical (0.04 * B)		$33,382	
Piping, Ductwork and Installation (0.02 *B)		$16,691	
Insulation for Ductwork (0.01 * B)		$8,346	
Painting (0.01 * B)		$8,346	
	Direct Installation Cost =		*$250,367*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,259,922*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$83,456	
Construction and Field Expenses (0.05 *B)		$41,728	
Contractor Fees (0.10 *B)		$83,456	
Start-Up (0.02 *B)		$16,691	
Performance Test (0.01 *B)		$8,346	
Contingencies (0.03 * B)		$25,037	
	Total Indirect Cost =		*$258,712*
	TOTAL CAPITAL INVESTMENT =		**$1,518,634**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Supervisor	= (15% of Operator Cost)		$2,190
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Maintenance Materials	= 100% of Maintenance Labor		$14,600
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	100	$12,143
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	260.0	$894,400
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	50.0	$18,944
		Total DC =	*$971,477*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$45,990	$27,594
Administrative	= 2% of Total Capital Investment		$30,373
Property Tax	= 1% of Total Capital Investment		$15,186
Insurance	= 1% of Total Capital Investment		$15,186
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$154,673
		Total IC =	*$243,012*
	TOTAL ANNUAL OPERATING COSTS =		**$1,214,489**

VENT SCRUBBER TO EXISTING CATALYTIC THERMAL OXIDIZER ON HPA

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: Existing)		$0	
Ancillary Equipment		$0	
Compressor		$500,000	
Ancillary Equipment		$75,000	
		Sum = "A" =	*$ 575,000.00*
Instrumentation (0.10 * A)		$57,500	
Sales Taxes (0.03 * A)		$17,250	
Freight (0.05 * A)		$28,750	
	Purchased Equipment Cost = "B" =		*$678,500*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$54,280	
Handling and Errection (0.14 * B)		$94,990	
Electrical (0.04 * B)		$27,140	
Piping, Ductwork and Installation (0.02 *B)		$13,570	
Insulation for Ductwork (0.01 * B)		$6,785	
Painting (0.01 * B)		$6,785	
	Direct Installation Cost =		*$203,550*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,057,050*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$67,850	
Construction and Field Expenses (0.05 *B)		$33,925	
Contractor Fees (0.10 *B)		$67,850	
Start-Up (0.02 *B)		$13,570	
Performance Test (0.01 *B)		$6,785	
Contingencies (0.03 * B)		$20,355	
	Total Indirect Cost =		*$210,335*
	TOTAL CAPITAL INVESTMENT =		**$1,267,385**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	478	$58,043
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	250.0	$860,000
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	1500.0	$568,322
		Total DC =	*$1,538,104*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$25,348
Property Tax	= 1% of Total Capital Investment		$12,674
Insurance	= 1% of Total Capital Investment		$12,674
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$129,083
		Total IC =	*$210,822*
	TOTAL ANNUAL OPERATING COSTS =		**$1,748,926**

VENT SCRUBBER REGENERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		445,000	
Ancillary Equipment		$66,750	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*546,250*
Instrumentation (0.10 * A)		$54,625	
Sales Taxes (0.03 * A)		$16,388	
Freight (0.05 * A)		$27,313	
	Purchased Equipment Cost = "B" =		*$644,575*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$51,566	
Handling and Errection (0.14 * B)		$90,241	
Electrical (0.04 * B)		$25,783	
Piping, Ductwork, and Installation (0.02 *B)		$12,892	
Insulation for Ductwork (0.01 * B)		$6,446	
Painting (0.01 * B)		$6,446	
	Direct Installation Cost =		*$193,373*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,012,948*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$64,458	
Construction and Field Expenses (0.05 *B)		$32,229	
Contractor Fees (0.10 *B)		$64,458	
Start-Up (0.02 *B)		$12,892	
Performance Test (0.01 *B)		$6,446	
Contingencies (0.03 * B)		$19,337	
	Total Indirect Cost =		*$199,818*
	TOTAL CAPITAL INVESTMENT =		**$1,212,766**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	232.5	$799,800
Electricity	= $/kWhr* kWhr *8760 hr/yr	80.0	$40,646
Media Replacement	= CF media * $50/CF / 3 years	750.0	$12,500
		Total DC =	*$904,685*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$24,255
Property Tax	= 1% of Total Capital Investment		$12,128
Insurance	= 1% of Total Capital Investment		$12,128
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$123,520
		Total IC =	*$203,074*
	TOTAL ANNUAL OPERATING COSTS =		**$1,107,759**

VENT SCRUBBER RECUPERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$335,000	
Ancillary Equipment		$50,250	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$419,750*
Instrumentation (0.10 * A)		$41,975	
Sales Taxes (0.03 * A)		$12,593	
Freight (0.05 * A)		$20,988	
	Purchased Equipment Cost = "B" =		*$495,305*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$39,624	
Handling and Errection (0.14 * B)		$69,343	
Electrical (0.04 * B)		$19,812	
Piping, Ductwork, and Installation (0.02 *B)		$9,906	
Insulation for Ductwork (0.01 * B)		$4,953	
Painting (0.01 * B)		$4,953	
	Direct Installation Cost =		*$148,592*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$818,897*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$49,531	
Construction and Field Expenses (0.05 *B)		$24,765	
Contractor Fees (0.10 *B)		$49,531	
Start-Up (0.02 *B)		$9,906	
Performance Test (0.01 *B)		$4,953	
Contingencies (0.03 * B)		$14,859	
	Total Indirect Cost =		*$153,545*
	TOTAL CAPITAL INVESTMENT =		**$972,441**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	387.5	$1,333,000
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	26.0	$9,851
		Total DC =	*$1,394,590*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$19,449
Property Tax	= 1% of Total Capital Investment		$9,724
Insurance	= 1% of Total Capital Investment		$9,724
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$258,367
		Total IC =	*$328,307*
	TOTAL ANNUAL OPERATING COSTS =		**$1,722,897**

VENT SCRUBBER FLARE

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Flare (User Input Cost: OAQPS Info)		$ 327,000	
Knock Out Drum (User Input Cost: OAQPS Info)		$ 23,400	
Fan		$ 30,000	
Ancillary Equipment		$ 4,500	
		Sum = "A" =	*$ 384,900*
Instrumentation (0.10 * A)		$38,490	
Sales Taxes (0.03 * A)		$11,547	
Freight (0.05 * A)		$19,245	
	Purchased Equipment Cost = "B" =		*$454,182*
Direct Installation Costs			
Foundation & Supports (0.08 * B)		$36,335	
Handling & Errection (0.14 * B)		$63,585	
Electrical (0.04 * B)		$18,167	
Piping, Ductwork & Installation (0.02 *B)		$9,084	
Insulation for Ductwork (0.01 * B)		$4,542	
Painting (0.02 * B)		$9,084	
	Direct Installation Cost =		*$140,796*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$769,978*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$45,418	
Construction & Field Expenses (0.05 *B)		$22,709	
Contractor Fees (0.10 *B)		$45,418	
Start-Up (0.02 *B)		$9,084	
Performance Test (0.01 *B)		$4,542	
Contingencies (0.03 * B)		$13,625	
	Total Indirect Cost =		*$140,796*
TOTAL CAPITAL INVESTMENT =			**$910,775**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= 200 hr/yr	200.00	$9,000
Supervisor	= (15% of Operator Cost)		$1,350
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	45	$17,050
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	1	$1,734
Fuel	= $/1000 cf * scf/min * 60 min * 8760 hr.yr	12500	$22,600,800
		Total DC =	*$22,662,784*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$43,200	$25,920
Administrative	= 2% of Total Capital Investment		$18,215
Property Tax	= 1% of Total Capital Investment		$9,108
Insurance	= 1% of Total Capital Investment		$9,108
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$92,762
		Total IC =	*$155,113*
TOTAL ANNUAL OPERATING COSTS =			**$22,817,898**

VENT SCRUBBER WET SCRUBBER/CONDENSER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
Direct Costs		
Purchased Equipment Costs: Scrubber		
Scrubber (User Input Cost: QAQPS USEPA Factor)	$285,000	
Ancillary Equipment	$42,750	
Condenser	$50,000	
Ancillary Equipment	$7,500	
Fan	$30,000	
Ancillary Equipment	$4,500	
	Sum = "A" =	*$419,750*
Instrumentation (0.10 * A)	$37,778	
Sales Taxes (0.03 * A)	$20,988	
Freight (0.05 * A)	$33,580	
Purchased Equipment Cost = "B" =		*$512,095*
Direst Installation Costs		
Foundation and Supports (0.12 * B)	$61,451	
Handling and Errection (0.40 * B)	$204,838	
Electrical (0.01 * B)	$5,121	
Piping, Ductwork, and Installation (0.30 *B)	$153,629	
Insulation (0.01 * B)	$5,121	
Painting (0.01 * B)	$5,121	
Direct Installation Cost =		*$435,281*
Site Preparation (User Inputs Actual Cost)	$150,000	
Facilities and Buildings (User Inputs Actual Cost)	$25,000	
Total Direct Cost =		*$1,122,376*
Indirect Cost (Installation)		
Engineering (0.10 * B)	$51,210	
Construction and Field Expenses (0.10 *B)	$51,210	
Contractor Fees (0.10 *B)	$51,210	
Start-Up (0.01 *B)	$5,121	
Performance Test (0.01 *B)	$5,121	
Contingencies (0.03 * B)	$15,363	
Total Indirect Cost =		*$179,233*
TOTAL CAPITAL INVESTMENT =		**$1,301,609**

	(Basis of Calculations)		
Direct Annual Costs (DC)			
Operating Labor			
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr * hp * 1 kWhr/1.341 hp * 8760 hr/yr	30	$11,366
Water	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	38	$53,327
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	150	$260,172
Caustic	=lb/hr * $/lb * 8760 hr/yr	46.3	$125,597
		Total DC =	*$502,201*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$26,032
Property Tax	= 1% of Total Capital Investment		$13,016
Insurance	= 1% of Total Capital Investment		$13,016
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$132,569
		Total IC =	*$215,676*
TOTAL ANNUAL OPERATING COSTS =			**$717,878**

HPA BIOFILTRATION

BASIS: EPA-456/R-03-003 September 2003/OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Bioflitration			
Biofiltration (User Input Cost: USEPA standard cost per cfm Info)		$363,800	
Ancillary Equipment		$36,380	
Condenser		$50,000	
Ancillary Equipment		$5,000	
Blower		$30,000	
Ancillary Equipment		$3,000	
		Sum = "A" =	*$488,180*
Instrumentation (0.10 * A)		$48,818	
Sales Taxes (0.03 * A)		$14,645	
Freight (0.05 * A)		$24,409	
	Purchased Equipment Cost = "B" =		*$576,052*
Direst Installation Costs			
Foundation & Supports (0.02 * B)		$11,521	
Handling & Errection (0.04 * B)		$23,042	
Electrical (0.04 * B)		$23,042	
Piping & Ductwork Installation (0.04 *B)		$23,042	
Insulation for Ductwork (0.01 * B)		$5,761	
Painting (0.00 * B)		$0	
	Direct Installation Cost =		*$86,408*
Site Preparation (User Inputs Actual Cost)		$50,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$737,460*
Indirect Cost (Installation)			
Engineering (0.05 * B)		$28,803	
Construction & Field Expenses (0.02 *B)		$11,521	
Contractor Fees (0.10 *B)		$57,605	
Start-Up (0.02 *B)		$11,521	
Performance Test (0.01 *B)		$5,761	
Contingencies (0.03 * B)		$17,282	
	Total Indirect Cost =		*$132,492*
	TOTAL CAPITAL INVESTMENT =		**$869,952**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.20	$6,570
Maintenance Materials	= 100% of Maintenance Labor		$6,570
Bed Replacement Labor	= 2 people x 8 hr/day x 3 days x 2 per year x $/hr	96	$4,320
Bed Media Cost	= cuyd x 2 x $50/cu yd	277	$27,700
Utilities:			
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	25	$9,472
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	150	$260,172
		Total DC =	*$333,693*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$64,049	$38,429
Administrative	= 2% of Total Capital Investment		$17,399
Property Tax	= 1% of Total Capital Investment		$8,700
Insurance	= 1% of Total Capital Investment		$8,700
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$88,605
		Total IC =	*$161,832*
	TOTAL ANNUAL OPERATING COSTS =		**$495,525**

VENT SCRUBBER REFRIGERATED CONDENSER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Refrigerated Condenser			
Condenser (User Input Cost: QAQPS Info)		$125,000	
Ancillary Equipment		$31,250	N/A
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$190,750*
Instrumentation (0.10 * A)		$19,075	
Sales Taxes (0.03 * A)		$5,723	
Freight (0.05 * A)		$9,538	
	Purchased Equipment Cost = "B" =		*$225,085*
Direst Installation Costs			
Foundation & Supports (0.08 * B)		$18,007	
Handling & Errection (0.14 * B)		$31,512	
Electrical (0.04 * B)		$9,003	
Piping, Ductwork & Installation (0.02 *B)		$4,502	
Insulation for Ductwork (0.01 * B)		$2,251	
Painting (0.02 * B)		$4,502	
	Direct Installation Cost =		*$69,776*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities & Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$469,861*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$22,509	
Construction & Field Expenses (0.05 *B)		$11,254	
Contractor Fees (0.10 *B)		$22,509	
Start-Up (0.02 *B)		$4,502	
Performance Test (0.01 *B)		$2,251	
Contingencies (0.03 * B)		$6,753	
	Total Indirect Cost =		*$69,776*
	TOTAL CAPITAL INVESTMENT =		**$539,638**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.50	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	(Actual Cost Per User)		$0
Parts Cost	(5% of Purchased Cost)		$0
Utilities:			
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	50	$18,944
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	150	$260,172
		Total DC =	*$330,855*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$10,793
Property Tax	= 1% of Total Capital Investment		$5,396
Insurance	= 1% of Total Capital Investment		$5,396
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$54,962
		Total IC =	*$107,591*
	TOTAL ANNUAL OPERATING COSTS =		**$438,446**

FUGITIVES VOC COST TABLES

Existing LDAR Program

COST ITEM		COST	TOTALS
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
LDAR Technician	= (hrs/month* 12 * $/hr)	120	$64,800
Supervisor	= (hrs/month* 12 * $/hr)	10	$7,800
Repairs Labor	= (hrs/month* 12 * $/hr)	3	$1,620
Repairs Materials	= 100% of Maintenance Labor		$1,620
		Total DC =	*$75,840*
	TOTAL ANNUAL OPERATING COSTS =		**$75,840**

Upgrade NSPS VV Portion to NSPS Vva

COST ITEM		COST	TOTALS
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
LDAR Technician	= (hrs/month* 12 * $/hr)	135	$72,900
Supervisor	= (hrs/month* 12 * $/hr)	10	$7,800
Repairs Labor	= (hrs/month* 12 * $/hr)	8	$4,320
Repairs Materials	= 100% of Maintenance Labor		$4,320
		Total DC =	*$89,340*
	TOTAL ANNUAL OPERATING COSTS =		**$89,340**

Upgrade NSPS VV Portion to HON

COST ITEM		COST	TOTALS
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
LDAR Technician	= (hrs/month* 12 * $/hr)	145	$78,300
Supervisor	= (hrs/month* 12 * $/hr)	10	$7,800
Repairs Labor	= (hrs/month* 12 * $/hr)	20	$10,800
Repairs Materials	= 100% of Maintenance Labor		$10,800
		Total DC =	*$107,700*
	TOTAL ANNUAL OPERATING COSTS =		**$107,700**

LPA CO COST TABLES
LPA THERMAL OXIDIZER
BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (Input Cost: QAQPS USEPA Factor)		$255,000	
Ancillary Equipment		$38,250	N/A
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$327,750*
Instrumentation (0.10 * A)		$32,775	
Sales Taxes (0.03 * A)		$9,833	
Freight (0.05 * A)		$16,388	
	Purchased Equipment Cost = "B" =		*$386,745*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$30,940	
Handling and Errection (0.14 * B)		$54,144	
Electrical (0.04 * B)		$15,470	
Piping, Ductwork, and Installation (0.02 *B)		$7,735	
Insulation for Ductwork (0.01 * B)		$3,867	
Painting (0.01 * B)		$3,867	
	Direct Installation Cost =		*$116,024*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$677,769*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$38,675	
Construction and Field Expenses (0.05 *B)		$19,337	
Contractor Fees (0.10 *B)		$38,675	
Start-Up (0.02 *B)		$7,735	
Performance Test (0.01 *B)		$3,867	
Contingencies (0.03 * B)		$11,602	
	Total Indirect Cost =		*$119,891*
	TOTAL CAPITAL INVESTMENT =		**$797,659**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$32,850
Supervisor	= (15% of Operator Cost)		$4,928
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$5,475
Maintenance Materials	= 100% of Maintenance Labor		$5,475
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	182.0	$329,068
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	40.5	$15,345
		Total DC =	*$393,140*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$48,728	$29,237
Administrative	= 2% of Total Capital Investment		$15,953
Property Tax	= 1% of Total Capital Investment		$7,977
Insurance	= 1% of Total Capital Investment		$7,977
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$81,242
		Total IC =	*$142,384*
	TOTAL ANNUAL OPERATING COSTS =		**$535,524**

LPA CATALYTIC THERMAL OXIDIZER (New)

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$ 417,000	
Ancillary Equipment		$62,550	N/A
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$ 514,050.00*
Instrumentation (0.10 * A)		$51,405	
Sales Taxes (0.03 * A)		$15,422	
Freight (0.05 * A)		$25,703	
	Purchased Equipment Cost = "B" =		*$606,579*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$48,526	
Handling and Errection (0.14 * B)		$84,921	
Electrical (0.04 * B)		$24,263	
Piping, Ductwork, and Installation (0.02 *B)		$12,132	
Insulation for Ductwork (0.01 * B)		$6,066	
Painting (0.01 * B)		$6,066	
	Direct Installation Cost =		*$181,974*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$963,553*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$60,658	
Construction and Field Expenses (0.05 *B)		$30,329	
Contractor Fees (0.10 *B)		$60,658	
Start-Up (0.02 *B)		$12,132	
Performance Test (0.01 *B)		$6,066	
Contingencies (0.03 * B)		$18,197	
	Total Indirect Cost =		*$188,039*
	TOTAL CAPITAL INVESTMENT =		**$1,151,592**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Supervisor	= (15% of Operator Cost)		$2,190
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Maintenance Materials	= 100% of Maintenance Labor		$14,600
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	50	$6,071
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	65.0	$117,524
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	40.5	$15,345
		Total DC =	*$184,930*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$45,990	$27,594
Administrative	= 2% of Total Capital Investment		$23,032
Property Tax	= 1% of Total Capital Investment		$11,516
Insurance	= 1% of Total Capital Investment		$11,516
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$117,290
		Total IC =	*$190,947*
	TOTAL ANNUAL OPERATING COSTS =		**$375,878**

LPA TO EXISTING CATALYTIC THERMAL OXIDIZER ON HPA

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: Existing Unit			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$0	
Ancillary Equipment		$0	
Compressor		$300,000	
Ancillary Equipment		$45,000	
		Sum = "A" =	*$345,000*
Instrumentation (0.10 * A)		$34,500	
Sales Taxes (0.03 * A)		$10,350	
Freight (0.05 * A)		$17,250	
	Purchased Equipment Cost = "B" =		*$407,100*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$32,568	
Handling and Errection (0.14 * B)		$56,994	
Electrical (0.04 * B)		$16,284	
Piping, Ductwork, and Installation (0.02 *B)		$8,142	
Insulation for Ductwork (0.01 * B)		$4,071	
Painting (0.01 * B)		$4,071	
	Direct Installation Cost =		*$122,130*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$704,230*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$40,710	
Construction and Field Expenses (0.05 *B)		$20,355	
Contractor Fees (0.10 *B)		$40,710	
Start-Up (0.02 *B)		$8,142	
Performance Test (0.01 *B)		$4,071	
Contingencies (0.03 * B)		$12,213	
	Total Indirect Cost =		*$126,201*
TOTAL CAPITAL INVESTMENT =			**$830,431**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	3	$98,550
Maintenance Materials	= 100% of Maintenance Labor		$98,550
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	478	$58,043
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	65.0	$117,524
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	1341.0	$508,080
		Total DC =	*$899,636*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$215,989	$129,593
Administrative	= 2% of Total Capital Investment		$16,609
Property Tax	= 1% of Total Capital Investment		$8,304
Insurance	= 1% of Total Capital Investment		$8,304
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$0
		Total IC =	*$162,810*
TOTAL ANNUAL OPERATING COSTS =			**$1,062,446**

LPA REGENERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		480,000	
Ancillary Equipment		$72,000	N/A
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*586,500*
Instrumentation (0.10 * A)		$58,650	
Sales Taxes (0.03 * A)		$17,595	
Freight (0.05 * A)		$29,325	
	Purchased Equipment Cost = "B" =		*$692,070*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$55,366	
Handling and Errection (0.14 * B)		$96,890	
Electrical (0.04 * B)		$27,683	
Piping, Ductwork, and Installation (0.02 *B)		$13,841	
Insulation for Ductwork (0.01 * B)		$6,921	
Painting (0.01 * B)		$6,921	
	Direct Installation Cost =		*$207,621*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,074,691*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$69,207	
Construction and Field Expenses (0.05 *B)		$34,604	
Contractor Fees (0.10 *B)		$69,207	
Start-Up (0.02 *B)		$13,841	
Performance Test (0.01 *B)		$6,921	
Contingencies (0.03 * B)		$20,762	
	Total Indirect Cost =		*$214,542*
TOTAL CAPITAL INVESTMENT =			**$1,289,233**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	91.0	$164,534
Electricity	= $/kWhr* kWhr *8760 hr/yr	48.0	$24,388
Media Replacement	= CF media * $50/CF / 2 years	400.0	$10,000
		Total DC =	*$250,660*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$25,785
Property Tax	= 1% of Total Capital Investment		$12,892
Insurance	= 1% of Total Capital Investment		$12,892
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$131,308
		Total IC =	*$213,921*
TOTAL ANNUAL OPERATING COSTS =			**$464,581**

LPA RECUPERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$600,000	
Ancillary Equipment		$90,000	
Blower		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$724,500*
Instrumentation (0.10 * A)		$72,450	
Sales Taxes (0.03 * A)		$21,735	
Freight (0.05 * A)		$36,225	
	Purchased Equipment Cost = "B" =		*$854,910*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$68,393	
Handling and Errection (0.14 * B)		$119,687	
Electrical (0.04 * B)		$34,196	
Piping, Ductwork, and Installation (0.02 *B)		$17,098	
Insulation for Ductwork (0.01 * B)		$8,549	
Painting (0.01 * B)		$8,549	
	Direct Installation Cost =		*$256,473*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,286,383*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$85,491	
Construction and Field Expenses (0.05 *B)		$42,746	
Contractor Fees (0.10 *B)		$85,491	
Start-Up (0.02 *B)		$17,098	
Performance Test (0.01 *B)		$8,549	
Contingencies (0.03 * B)		$25,647	
	Total Indirect Cost =		*$265,022*
	TOTAL CAPITAL INVESTMENT =		**$1,551,405**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	45.5	$82,267
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	40.0	$15,155
		Total DC =	*$149,161*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$31,028
Property Tax	= 1% of Total Capital Investment		$15,514
Insurance	= 1% of Total Capital Investment		$15,514
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$258,367
		Total IC =	*$351,466*
	TOTAL ANNUAL OPERATING COSTS =		**$500,627**

HPA CO COST TABLES

HPA THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs: One 39,000 acfm TO Unit			
Thermal Oxidizer (Input Cost: QAQPS USEPA Factor)		$533,000	
Ancillary Equipment		$79,950	
		Sum = "A" =	*$612,950*
Instrumentation (0.10 * A)		$61,295	
Sales Taxes (0.03 * A)		$18,389	
Freight (0.05 * A)		$30,648	
	Purchased Equipment Cost = "B" =		*$723,281*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$57,862	
Handling and Errection (0.14 * B)		$101,259	
Electrical (0.04 * B)		$28,931	
Piping, Ductwork, and Installation (0.02 *B)		$14,466	
Insulation for Ductwork (0.01 * B)		$7,233	
Painting (0.01 * B)		$7,233	
	Direct Installation Cost =		*$216,984*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,115,265*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$72,328	
Construction and Field Expenses (0.05 *B)		$36,164	
Contractor Fees (0.10 *B)		$72,328	
Start-Up (0.02 *B)		$14,466	
Performance Test (0.01 *B)		$7,233	
Contingencies (0.03 * B)		$21,698	
	Total Indirect Cost =		*$224,217*
	TOTAL CAPITAL INVESTMENT =		**$1,339,482**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	6425.9	$11,618,422
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	127.0	$48,125
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
		Total DC =	*$28,800,286*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$26,790
Property Tax	= 1% of Total Capital Investment		$13,395
Insurance	= 1% of Total Capital Investment		$13,395
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$136,426
		Total IC =	*$221,049*
	TOTAL ANNUAL OPERATING COSTS =		**$29,021,335**

HPA EXISTING CATALYTIC THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Existing Unit - No construction necessary including bromine scrubber			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$ -	
Ancillary Equipment		$0	
		Sum = "A" =	*$0*
Instrumentation (0.10 * A)		$0	
Sales Taxes (0.03 * A)		$0	
Freight (0.05 * A)		$0	
	Purchased Equipment Cost = "B" =		*$0*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$0	
Handling and Errection (0.14 * B)		$0	
Electrical (0.04 * B)		$0	
Piping, Ductwork, and Installation (0.02 *B)		$0	
Insulation for Ductwork (0.01 * B)		$0	
Painting (0.01 * B)		$0	
	Direct Installation Cost =		*$0*
Site Preparation (User Inputs Actual Cost)		$0	
Facilities and Buildings (User Inputs Actual Cost)		$0	
	Total Direct Cost =		*$0*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$0	
Construction and Field Expenses (0.05 *B)		$0	
Contractor Fees (0.10 *B)		$0	
Start-Up (0.02 *B)		$0	
Performance Test (0.01 *B)		$0	
Contingencies (0.03 * B)		$0	
	Total Indirect Cost =		*$0*
TOTAL CAPITAL INVESTMENT =			**$0**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	478	$58,043
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	196.1	$354,522
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	15.0	$5,683
Wastewater	= $/1,000 gal * gal/min/1000 * 60 min/hr * 8760 hr/yr	15	$26,017
Sodium Formate	=lb/hr * $/lb * 8760 hr/yr	15.0	$40,734
		Total DC =	*$536,738*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$0
Property Tax	= 1% of Total Capital Investment		$0
Insurance	= 1% of Total Capital Investment		$0
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$0
		Total IC =	*$31,043*
TOTAL ANNUAL OPERATING COSTS =			**$567,782**

HPA REGENERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		1,056,200	
Ancillary Equipment		$158,430	
		Sum = "A" =	*1,214,630*
Instrumentation (0.10 * A)		$121,463	
Sales Taxes (0.03 * A)		$36,439	
Freight (0.05 * A)		$60,732	
	Purchased Equipment Cost = "B" =		*$1,433,263*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$114,661	
Handling and Errection (0.14 * B)		$200,657	
Electrical (0.04 * B)		$57,331	
Piping, Ductwork, and Installation (0.02 *B)		$28,665	
Insulation for Ductwork (0.01 * B)		$14,333	
Painting (0.01 * B)		$14,333	
	Direct Installation Cost =		*$429,979*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$2,038,242*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$143,326	
Construction and Field Expenses (0.05 *B)		$71,663	
Contractor Fees (0.10 *B)		$143,326	
Start-Up (0.02 *B)		$28,665	
Performance Test (0.01 *B)		$14,333	
Contingencies (0.03 * B)		$42,998	
	Total Indirect Cost =		*$444,312*
TOTAL CAPITAL INVESTMENT =			**$2,482,554**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	642.6	$1,161,842
Electricity	= $/kWhr* kWhr *8760 hr/yr	395.0	$200,692
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
Media Replacement	= CF media * $50/CF / 3 years	10000.0	$166,667
		Total DC =	*$18,662,939*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$49,651
Property Tax	= 1% of Total Capital Investment		$24,826
Insurance	= 1% of Total Capital Investment		$24,826
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$418,691
		Total IC =	*$549,037*
TOTAL ANNUAL OPERATING COSTS =			**$19,211,976**

HPA RECUPERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: VQAQPS USEPA Factor)		$896,500	
Ancillary Equipment		$134,475	
		Sum = "A" =	*$1,030,975*
Instrumentation (0.10 * A)		$103,098	
Sales Taxes (0.03 * A)		$30,929	
Freight (0.05 * A)		$51,549	
	Purchased Equipment Cost = "B" =		*$1,216,551*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$97,324	
Handling and Errection (0.14 * B)		$170,317	
Electrical (0.04 * B)		$48,662	
Piping, Ductwork, and Installation (0.02 *B)		$24,331	
Insulation for Ductwork (0.01 * B)		$12,166	
Painting (0.01 * B)		$12,166	
	Direct Installation Cost =		*$364,965*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,756,516*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$121,655	
Construction and Field Expenses (0.05 *B)		$60,828	
Contractor Fees (0.10 *B)		$121,655	
Start-Up (0.02 *B)		$24,331	
Performance Test (0.01 *B)		$12,166	
Contingencies (0.03 * B)		$36,497	
	Total Indirect Cost =		*$377,131*
	TOTAL CAPITAL INVESTMENT =		**$2,133,646**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.2	$6,570
Maintenance Materials	= 100% of Maintenance Labor		$6,570
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	3212.9	$5,809,211
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	301.7	$114,297
Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20000.0	$17,082,000
		Total DC =	*$23,037,537*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$32,029	$19,217
Administrative	= 2% of Total Capital Investment		$42,673
Property Tax	= 1% of Total Capital Investment		$21,336
Insurance	= 1% of Total Capital Investment		$21,336
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$258,367
		Total IC =	*$362,930*
	TOTAL ANNUAL OPERATING COSTS =		**$23,400,467**

Carrier Gas Addition - Nitrogen

Nitrogen for carrier	$/1000 scf * scfm carrier gas *60 min/hr*8760 hr/yr	20,000	**$17,082,000**

CRYSTALLIZER VENT SCRUBBER CO COST TABLES

VENT SCRUBBER THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (Input Cost: QAQPS USEPA Factor)		$225,000	
Ancillary Equipment		$33,750	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$293,250*
Instrumentation (0.10 * A)		$29,325	
Sales Taxes (0.03 * A)		$8,798	
Freight (0.05 * A)		$14,663	
	Purchased Equipment Cost = "B" =		*$346,035*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$27,683	
Handling and Errection (0.14 * B)		$48,445	
Electrical (0.04 * B)		$13,841	
Piping, Ductwork, and Installation (0.02 *B)		$6,921	
Insulation for Ductwork (0.01 * B)		$3,460	
Painting (0.01 * B)		$3,460	
	Direct Installation Cost =		*$103,811*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$624,846*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$34,604	
Construction and Field Expenses (0.05 *B)		$17,302	
Contractor Fees (0.10 *B)		$34,604	
Start-Up (0.02 *B)		$6,921	
Performance Test (0.01 *B)		$3,460	
Contingencies (0.03 * B)		$10,381	
	Total Indirect Cost =		*$107,271*
	TOTAL CAPITAL INVESTMENT =		**$732,116**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$32,850
Supervisor	= (15% of Operator Cost)		$4,928
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$5,475
Maintenance Materials	= 100% of Maintenance Labor		$5,475
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	775.0	$1,401,250
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	31.5	$11,935
		Total DC =	*$1,461,912*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$48,728	$29,237
Administrative	= 2% of Total Capital Investment		$14,642
Property Tax	= 1% of Total Capital Investment		$7,321
Insurance	= 1% of Total Capital Investment		$7,321
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$74,566
		Total IC =	*$133,087*
	TOTAL ANNUAL OPERATING COSTS =		**$1,594,999**

VENT SCRUBBER CATALYTIC THERMAL OXIDIZER (New)

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$ 585,000	
Ancillary Equipment		$87,750	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$ 707,250.00*
Instrumentation (0.10 * A)		$70,725	
Sales Taxes (0.03 * A)		$21,218	
Freight (0.05 * A)		$35,363	
	Purchased Equipment Cost = "B" =		*$834,555*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$66,764	
Handling and Errection (0.14 * B)		$116,838	
Electrical (0.04 * B)		$33,382	
Piping, Ductwork and Installation (0.02 *B)		$16,691	
Insulation for Ductwork (0.01 * B)		$8,346	
Painting (0.01 * B)		$8,346	
	Direct Installation Cost =		*$250,367*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$1,259,922*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$83,456	
Construction and Field Expenses (0.05 *B)		$41,728	
Contractor Fees (0.10 *B)		$83,456	
Start-Up (0.02 *B)		$16,691	
Performance Test (0.01 *B)		$8,346	
Contingencies (0.03 * B)		$25,037	
	Total Indirect Cost =		*$258,712*
TOTAL CAPITAL INVESTMENT =			**$1,518,634**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Supervisor	= (15% of Operator Cost)		$2,190
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$14,600
Maintenance Materials	= 100% of Maintenance Labor		$14,600
Replacement Labor	N/A		$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years	100	$12,143
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	260.0	$894,400
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	50.0	$18,944
		Total DC =	*$971,477*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$45,990	$27,594
Administrative	= 2% of Total Capital Investment		$30,373
Property Tax	= 1% of Total Capital Investment		$15,186
Insurance	= 1% of Total Capital Investment		$15,186
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$154,673
		Total IC =	*$243,012*
TOTAL ANNUAL OPERATING COSTS =			**$1,214,489**

VENT SCRUBBER TO EXISTING CATALYTIC THERMAL OXIDIZER ON HPA

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM			COST	TOTALS
Direct Costs				
Purchased Equipment Costs:				
Thermal Oxidizer (User Input Cost: Existing)			$0	
Ancillary Equipment			$0	
Compressor			$500,000	
Ancillary Equipment			$75,000	
			Sum = "A" =	*$ 575,000.00*
Instrumentation (0.10 * A)			$57,500	
Sales Taxes (0.03 * A)			$17,250	
Freight (0.05 * A)			$28,750	
	Purchased Equipment Cost = "B" =			*$678,500*
Direst Installation Costs				
Foundation and Supports (0.08 * B)			$54,280	
Handling and Errection (0.14 * B)			$94,990	
Electrical (0.04 * B)			$27,140	
Piping, Ductwork and Installation (0.02 *B)			$13,570	
Insulation for Ductwork (0.01 * B)			$6,785	
Painting (0.01 * B)			$6,785	
	Direct Installation Cost =			*$203,550*
Site Preparation (User Inputs Actual Cost)			$150,000	
Facilities and Buildings (User Inputs Actual Cost)			$25,000	
	Total Direct Cost =			*$1,057,050*
Indirect Cost (Installation)				
Engineering (0.10 * B)			$67,850	
Construction and Field Expenses (0.05 *B)			$33,925	
Contractor Fees (0.10 *B)			$67,850	
Start-Up (0.02 *B)			$13,570	
Performance Test (0.01 *B)			$6,785	
Contingencies (0.03 * B)			$20,355	
	Total Indirect Cost =			*$210,335*
	TOTAL CAPITAL INVESTMENT =			**$1,267,385**
Direct Annual Costs (DC)				
Operating Labor	***(Basis of Calculations)***			
Operator	= (hr/shift * shifts/day * days/yr * $/hr)		0.5	$16,425
Supervisor	= (15% of Operator Cost)			$2,464
Operating Materials	(If Any)			$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)		0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor			$16,425
Replacement Labor	N/A			$0
Catalyst Cost	= CF cat* $850/CF* 1@7 years		478	$58,043
Utilities:				
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)		250.0	$860,000
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr		1500.0	$568,322
			Total DC =	*$1,538,104*
Indirect Annual Costs (IC)				
Overhead	= 60% of the Sum of Total Labor + Materials		$51,739	$31,043
Administrative	= 2% of Total Capital Investment			$25,348
Property Tax	= 1% of Total Capital Investment			$12,674
Insurance	= 1% of Total Capital Investment			$12,674
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)			$129,083
			Total IC =	*$210,822*
	TOTAL ANNUAL OPERATING COSTS =			**$1,748,926**

VENT SCRUBBER REGENERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM	COST	TOTALS
Direct Costs		
Purchased Equipment Costs		
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)	445,000	
Ancillary Equipment	$66,750	
Fan	$30,000	
Ancillary Equipment	$4,500	
	Sum = "A" =	*546,250*
Instrumentation (0.10 * A)	$54,625	
Sales Taxes (0.03 * A)	$16,388	
Freight (0.05 * A)	$27,313	
Purchased Equipment Cost = "B" =		*$644,575*
Direst Installation Costs		
Foundation and Supports (0.08 * B)	$51,566	
Handling and Errection (0.14 * B)	$90,241	
Electrical (0.04 * B)	$25,783	
Piping, Ductwork, and Installation (0.02 *B)	$12,892	
Insulation for Ductwork (0.01 * B)	$6,446	
Painting (0.01 * B)	$6,446	
Direct Installation Cost =		*$193,373*
Site Preparation (User Inputs Actual Cost)	$150,000	
Facilities and Buildings (User Inputs Actual Cost)	$25,000	
Total Direct Cost =		*$1,012,948*
Indirect Cost (Installation)		
Engineering (0.10 * B)	$64,458	
Construction and Field Expenses (0.05 *B)	$32,229	
Contractor Fees (0.10 *B)	$64,458	
Start-Up (0.02 *B)	$12,892	
Performance Test (0.01 *B)	$6,446	
Contingencies (0.03 * B)	$19,337	
Total Indirect Cost =		*$199,818*
TOTAL CAPITAL INVESTMENT =		**$1,212,766**

Item	Basis	Value	Totals
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	232.5	$799,800
Electricity	= $/kWhr* kWhr *8760 hr/yr	80.0	$40,646
Media Replacement	= CF media * $50/CF / 3 years	750.0	$12,500
		Total DC =	*$904,685*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$24,255
Property Tax	= 1% of Total Capital Investment		$12,128
Insurance	= 1% of Total Capital Investment		$12,128
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$123,520
		Total IC =	*$203,074*
TOTAL ANNUAL OPERATING COSTS =			**$1,107,759**

VENT SCRUBBER RECUPERATIVE THERMAL OXIDIZER

BASIS: OAQPS Cost Manual (Sixth Edition)

COST ITEM		COST	TOTALS
Direct Costs			
Purchased Equipment Costs:			
Thermal Oxidizer (User Input Cost: QAQPS USEPA Factor)		$335,000	
Ancillary Equipment		$50,250	
Fan		$30,000	
Ancillary Equipment		$4,500	
		Sum = "A" =	*$419,750*
Instrumentation (0.10 * A)		$41,975	
Sales Taxes (0.03 * A)		$12,593	
Freight (0.05 * A)		$20,988	
	Purchased Equipment Cost = "B" =		*$495,305*
Direst Installation Costs			
Foundation and Supports (0.08 * B)		$39,624	
Handling and Errection (0.14 * B)		$69,343	
Electrical (0.04 * B)		$19,812	
Piping, Ductwork, and Installation (0.02 *B)		$9,906	
Insulation for Ductwork (0.01 * B)		$4,953	
Painting (0.01 * B)		$4,953	
	Direct Installation Cost =		*$148,592*
Site Preparation (User Inputs Actual Cost)		$150,000	
Facilities and Buildings (User Inputs Actual Cost)		$25,000	
	Total Direct Cost =		*$818,897*
Indirect Cost (Installation)			
Engineering (0.10 * B)		$49,531	
Construction and Field Expenses (0.05 *B)		$24,765	
Contractor Fees (0.10 *B)		$49,531	
Start-Up (0.02 *B)		$9,906	
Performance Test (0.01 *B)		$4,953	
Contingencies (0.03 * B)		$14,859	
	Total Indirect Cost =		*$153,545*
	TOTAL CAPITAL INVESTMENT =		**$972,441**
Direct Annual Costs (DC)			
Operating Labor	***(Basis of Calculations)***		
Operator	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Supervisor	= (15% of Operator Cost)		$2,464
Operating Materials	(If Any)		$0
Maintenance Labor	= (hr/shift * shifts/day * days/yr * $/hr)	0.5	$16,425
Maintenance Materials	= 100% of Maintenance Labor		$16,425
Replacement Labor	N/A		$0
Parts Cost	N/A		$0
Utilities:			
Fuel (natural gas)	(cfm/1000 * $/1000 cf * 60 min/hr *8760 hr/yr)	387.5	$1,333,000
Electricity	= $/kWhr*hp*1 kWhr/1.341 hp*8760 hr/yr	26.0	$9,851
		Total DC =	*$1,394,590*
Indirect Annual Costs (IC)			
Overhead	= 60% of the Sum of Total Labor + Materials	$51,739	$31,043
Administrative	= 2% of Total Capital Investment		$19,449
Property Tax	= 1% of Total Capital Investment		$9,724
Insurance	= 1% of Total Capital Investment		$9,724
Capital Recovery	(Based on 8% & 20 year life: Factor = 0.10185)		$258,367
		Total IC =	*$328,307*
	TOTAL ANNUAL OPERATING COSTS =		**$1,722,897**

Appendix E
Title V Permit Mark-up

The Title V permit mark-up that follows has the requested changes for this PSD application highlighted in yellow. Any changes not highlighted in yellow were included in the Title V renewal application previously submitted but do not have to be implemented for this application.

DHEC

PROMOTE PROTECT PROSPER

South Carolina Department of Health
and Environmental Control

Part 70 Air Quality Permit

BP Amoco Chemical Company-Cooper River Plant
1306 Amoco Drive
Wando, South Carolina 29492-7879
(Permit Updated 12/17/09)

In accordance with the provisions of the Pollution Control Act, Sections 48-1-50(5) and 48-1-110(a), and the 1976 Code of Laws of South Carolina, as amended, Regulation 61-62, the above named permittee is hereby granted permission to discharge air contaminants into the ambient air. The Bureau of Air Quality authorizes the operation of this facility and its applicable equipment specified herein in accordance with the plans, specifications and other information submitted in the Title V permit application dated December 17, 2003.

This permit is subject to and conditioned upon the terms, limitations, standards, and schedules contained in or specified on the 69 pages, with the accompanying attachments, of this permit.

Permit Number:	**TV-0420-0029**	**Effective Date:**	**October 1, 2007**
Issue Date:	**June 26, 2007**	**Expiration Date:**	**September 30, 2012**

Director, Engineering Services Division
Bureau of Air Quality

Non-Confidential

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PART 1.0 GENERAL INFORMATION

A. APPLICABLE PERMIT DATES

ISSUE DATE	: June 26, 2007
EFFECTIVE DATE	: October 1, 2007
EXPIRATION DATE	: September 30, 2012
RENEWAL APPLICATION DUE	: March 31, 2012

B. FACILITY INFORMATION

FEDERAL TAX IDENTIFICATION NO.	: 36-2347240
ENVIRONMENTAL CONTACT	: Brent A. Pace
CONTACT TELEPHONE NUMBER	: (843) 881-5182
INTERNET E-MAIL ADDRESS	: brent.pace@bp.com
FACILITY LOCATION	: Highway 98 & Clements Ferry Road
COUNTY	: Berkeley
SIC CODE(S)	: 2869
NAICS CODE(S)	: 325199
AFS CODE	: 4501500029

C. FACILITY ADDRESS

FACILITY NAME	: BP Amoco Chemical Company-Cooper River Site
ADDRESS	: 1306 Amoco Drive
CITY, STATE, ZIP	: Wando, South Carolina 29492-7879

D. FACILITY BILLING ADDRESS

FACILITY BILLING NAME	: BP Amoco Chemical Company-Cooper River Site
ADDRESS	: 1306 Amoco Drive
CITY, STATE, ZIP	: Wando, South Carolina 29492-7879

PART 5.0 EMISSION UNIT REQUIREMENTS

A. EMISSION UNIT DESCRIPTION

Table 5.1 is a description of emission units located at this facility.

TABLE 5.1 **EMISSION UNITS**		
Unit ID	**Unit Description**	**Control Device Description**
01	Boiler #1 (242 Million Btu/hr) **–VOID-**	Dust Collection Hopper (Voluntary Control Device) - VOID
02	Boiler #2 (242 Million Btu/hr) **–VOID-**	Dust Collection Hopper (Voluntary Control Device) - VOID
03	Cooper River #1: Oxidation Unit	Scrubbers, Catalytic Oxidizer, Condenser
04	Cooper River # 1: PTA Unit	Baghouse, Scubbers, Spray Nozzle
05	Cooper River #2: Oxidation Unit	Scrubbers, Catalytic Oxidizer, Condenser
06	Cooper River #2: PTA Unit	Baghouses, Scrubbers, Condenser
07	Shipping/Loading	Baghouses
08	Cooper River #1: Ox Four Compressors –VOID-	Low sulfur fuels –VOID-
09	Cooper River#2: Ox Emergency Generator (see Unit ID 11 below)	See Unit ID 11 below[MAD1]
10	CR#2 Utility Compressor #2 (see Unit ID 11 below)	See Unit ID 11 below[MAD2]
11	Utilities Generators, Compressors, and Pumps	N/A
12	Tank Farm	Internal Floating Roofs
13	Wastewater Treatment	~~Boilers (for biogas~~[MAD3]~~)~~
14	Waste Treatment Compressors	See Unit ID 11 above[MAD4]
15	Boiler #3 (Boiler AB-350A (390 Million Btu/hr))	Low ~~Nox~~ NOx Burners
16	Boiler #4 (Boiler AB-350B (390 Million Btu/hr))	Low ~~Nox~~ NOx Burners

N/A = Not Applicable

B. CONTROL DEVICE DESCRIPTION

Table 5.2 is a description of control devices located at this facility.

TABLE 5.2 **CONTROL DEVICES**				
Control Device ID	**Unit ID**	**Control Device Description**	**Installation Date**	**Pollutant(s) Controlled**
301A (DC)	~~(Unit ID~~ 01~~)~~	Dust Collection Hopper, Boiler #1(Voluntary Control Device) **–VOID-**	1977	Particulates
301B (DC)	~~(Unit ID~~ 02~~)~~	Dust Collection Hopper, Boiler #2 (Voluntary Control Device) **–VOID-**	1977	Particulates
CR#1-HPVGT	~~(Unit ID~~ 03~~)~~	High Pressure Vent Gas Treatment System (#1 Oxidation) (Consists of catalytic oxidizer and a scrubber)	1999	VOC, CO

TABLE 5.2 CONTROL DEVICES				
Control Device ID	**Unit ID**	**Control Device Description**	**Installation Date**	**Pollutant(s) Controlled**
BT-603	~~(Unit ID~~ 03~~)~~	Atmospheric (Low Pressure) Absorber	1977 2004 (Revision)	VOC
BM-504A	~~(Unit ID~~ 03~~)~~	Bag Filters; Intermediate Storage **–VOID-**	1977	Particulates
BM-504B	~~(Unit ID~~ 03~~)~~	Bag Filters; Intermediate Storage **–VOID-**	1977	Particulates
BT-501	~~(Unit ID~~ 03~~)~~	Scrubber: Intermediate Storage	2002	Particulates
BH-522	~~(Unit ID~~ 03~~)~~	Dry Cyclone Scrubber; Rotary Lock **–VOID-**	1983	Particulates
BE-645	~~(Unit ID~~ 03~~)~~	Condenser (Recovery Device)	1977	VOC
CM-301	~~(Unit ID~~ 04~~)~~	Venturi Scrubber; Crystallizer Vent Scrubber	1977	Particulates
CM-603A	~~(Unit ID~~ 04~~)~~	Bag Filter; Day Silo	1977	Particulates
CM-603B	~~(Unit ID~~ 04~~)~~	Bag Filter; Day Silo	1977	Particulates
CM-607A	~~(Unit ID~~ 04~~)~~	Dust Collectors /Rotary Lock **–VOID-**	1991	Particulates
CM-607B	~~(Unit ID~~ 04~~)~~	Dust Collectors/Rotary Lock**–VOID-**	1991	Particulates
CM-608A	~~(Unit ID~~ 04~~)~~	Dust Collectors /Screener	1991	Particulates
CM-608B	~~(Unit ID~~ 04~~)~~	Dust Collectors; Screener	1991	Particulates
CR#2-HPVGT	~~(Unit ID~~ 05~~)~~	High Pressure Vent Gas Treatment System DR-1814/DT-1821 (Consists of catalytic oxidizer and a scrubber)	1996	HAP's, VOC, CO
DT-302	~~(Unit ID~~ 05~~)~~	Atmospheric (Low Pressure) Absorber	1996	VOC
DT-500	~~(Unit ID~~ 04~~)~~	Venturi Scrubber and Spray Tower; Ox Feed Silos	1996	Particulates
DE-416	~~(Unit ID~~ 05~~)~~	Evaporator Overhead Condenser	1996	VOC
DM-601/DE-601	~~(Unit ID~~ 06~~)~~	Venturi Scrubber and Spray Tower Crystallizer Vent Scrubber	1996	Particulates
DE-317	~~(Unit ID~~ 06~~)~~	Mother Liquor Cooler Ejector Condenser	1996	VOC
DM-797A	~~(Unit ID~~ 06~~)~~	Day Silo Dust Collector	1996	Particulates
DM-797B	~~(Unit ID~~ 06~~)~~	Day Silo Dust Collector	1996	Particulates
CM-701A	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1977	Particulates
CM-701B	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1977	Particulates

TABLE 5.2 CONTROL DEVICES				
Control Device ID	Unit ID	Control Device Description	Installation Date	Pollutant(s) Controlled
CM-701C	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1977	Particulates
CM-701D	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1977	Particulates
CM-701E	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1977	Particulates
CM-720A (F Silo)	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1996	Particulates
CM-720B (F Silo)	~~(Unit ID~~ 07~~)~~	Storage Silo Bag Filter	1996	Particulates
CM-722	~~(Unit ID~~ 07~~)~~	Bulk Truck Loading Bag Filter	1996	Particulates
CM-705A	~~(Unit ID~~ 07~~)~~	Loading Spout Dust Collector	1977	Particulates
CM-705B	~~(Unit ID~~ 07~~)~~	Loading Spout Dust Collector	1977	Particulates
CM-705C	~~(Unit ID~~ 07~~)~~	Loading Spout Dust Collector	1977	Particulates

C. EQUIPMENT DESCRIPTION

A description of the equipment located at this facility is provided in the following tables:

TABLE 5.3 UNIT ID 03 – Cooper River #1 Oxidation Unit				
Equip ID	Equipment Description	Installation Date	Control Device ID	Stack ID
~~BR-301 A-D~~ BR-301	Reactors	~~5/3/77~~2014	~~High Pressure Absorber (Recovery Device; BT-401~~[MAD5]~~)~~ ~~then to~~ CR#1-HPVGT	O-2/10/15
BD-401/402	Crystallizers	5/3/77	~~High Pressure Absorber (Recovery Device; BT-401) then to~~ CR#1-HPVGT	O-2/10/15
BD-402/403	Crystallizer	5/3/77	~~BT-601(Dryer Scrubber)~~[MAD6] ~~then to~~ BT-603 (Low Ppressure ~~a~~Absorber)	O-3
BD-202	Solvent Charge	Modified 5/3/95	BT-603	O-3
BD-204	Feed Mix Drum	Modified 5/3/95	BT-603	O-3
BD-503	Filter Vacuum Pump Separator	Modified 5/3/95	BT-603	O-3
BD-602	Mother Liquor Drum	Modified 5/3/95	BT-603	O-3
BD-705	Dehydrated Solvent Drum (Bottom Receiver)	Modified 5/3/95	BT-603	O-3
BD-501	Filter	Modified 5/3/95	BT-603	O-3

TABLE 5.3 UNIT ID 03 – Cooper River #1 Oxidation Unit				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
BF-1401	Acetic Acid Tank	1977	BT-603	O-3
BM-502	Ox Product Dryer	5/3/77	BT-603	O-3
BT-701~~/BE-706~~	Dehydration Tower	Modified 5/3/95 and 2004 & 2011 &2014	~~DHT Scrubber (HON Recovery Device & Control) Control Device ID (BT-702)~~ BT-603 (HON Recovery Device)	~~O-23~~O-3[MAD7]
~~BT-701/BE-706~~	~~Dehydration Tower~~	~~Modified 5/3/95 and 2004~~	~~CR#1 HPVGTS~~	~~O-~~ 2/10/15 [MAD8]
BF-501A	Intermediate Storage Silo **-VOID-**	5/23/77	BM-504A-VOID	O-7
BF-501B	Intermediate Storage Silo **-VOID-**	5/23/77	BM-504B-VOID	O-8
BF-501A	Intermediate Storage Silo	2002	BT-501	O-22
BF-501B	Intermediate Storage Silo	2002	BT-501	O-22
BM-1101 A/B	Off Gas Dryer (Emission Point for BT-401)	Modified 5/3/95	None	O-10
~~BD-625~~	~~CRU Extraction Drum~~	~~8/7/80~~	~~None~~	~~O-11~~[MAD9]
~~BD-631~~	~~CRU Mother Liquor Drum~~	~~8/7/80~~	~~None~~	~~O-12~~[MAD10]
~~BD-632~~	~~CRU Waste Solids Reslurry Drum~~	~~1983~~	~~None~~	~~O-13~~[MAD11]
BH-523	Dryer Rotary Lock Venting System (Fluidizer) **-VOID-**	1983	BH-522(VOID)	O-14
BM-1101C/D	Off Gas Dryer (Emission Point for B-401)	2/1/85[MAD12]	None	O-15
~~BD-640~~	~~CRU Evaporator~~	~~8/7/80~~	~~BE-645~~	~~O-16~~[MAD13]
BM-1201	Emergency Generator #2[MAD14]	~~5/23/77~~Replaced in 2015	None	O-17
BM-1204	Emergency Generator #3[DM15]	2015	None	O-24

The CR#1 Dehydration Tower is a HON Group 2 stream, with a TRE between 1 and 4, after the ~~DHT Scrubber~~Low Pressure Absorber (HON Recovery Device). ~~The DHT Scrubber outlet will normally go via the LPVGT system to the CR#1 HPVGTS. However, the DHT Scrubber can vent to the atmosphere (Vent O-23) per the emission~~ [MAD16]~~limitations from construction permit 0420-0029-CR.~~

TABLE 5.4 UNIT ID 04 – Cooper River #1:PTA Unit				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
CD-101/ CH-108	Feed Slurry Drum and Eductor	5/23/77	None	P-1
CD-413	Reslurry Solvent Drum	Modified 5/3/95	BT-603	O-3
CD-411	Mother Liquor Solids Reslurry Drum	Modified 5/3/95	BT-603	O-3
CD-301-303, CD-305	Crystallizers	5/23/77	CM-301	P-2
CM-402A/B	Filters	2011	N/A	N/A
CM-403A	Product Dryer and Vacuum System	5/23/77	None	P-3A
CM-403B	Product Dryer and Vacuum System	5/23/77	None	P-3B

TABLE 5.4 UNIT ID 04 – Cooper River #1:PTA Unit

Equip ID	Equipment Description	Installation Date	Control Device ID	Stack ID
CD-404A	Atmospheric Mother Liquor Flash Drum	5/23/77 Modified in 2005	CM-301	P-2
CR-202	Reactor	5/23/77	CM-301	P-2
CF-601A	Day Silo	5/23/77	CM-603A	P-4A
CF-601B	Day Silo	5/23/77	CM-603B	~~P-5B~~P-4B[MAD17]
CD-405	Filter Feed Drum and CH-418 Maintenance Spray	5/23/77	None	P-14
CM-609A	Product Screener A	1991	CM-608A	P-17
CM-609B	Product Screener B	1991	CM-608B	P-18
CH-430	Vacuum Ejector	8/7/80	None	P-19
CH-431	Hogger Vacuum Ejector	8/7/80	None	P-19
CD-412	Filtrate	8/7/80	None	P-19

TABLE 5.5 UNIT ID 05 – Cooper River #2 Oxidation Unit

Equip ID	Equipment Description	Installation Date	Control Device ID	Stack ID
~~O2-1~~[MAD18] DM-302	Product Dryer	6/22/95	DT-302	O2-1
DD-303	TA Filter Feed Drum-Vacuum Pump KO Drum	6/22/95	DT-302	O2-1
DD-306	Mother Liquor Drum	6/22/95	DT-302	O2-1
DD-405	Dehydrated Solvent Drum	6/22/95	DT-302	O2-1
DD-202/203	Crystallizers ~~Condenser~~	6/22/95	DT-302	O2-1
DD-307	Slurry Surge Drum	6/22/95	DT-302	O2-1
DD-103	Catalyst Charge Drum	6/22/95	DT-302	O2-1
DE-110[MAD19]	Feed Mix Drum Vent Condenser	6/22/95	DT-302	O2-1
DE-204[MAD20]	Crystallizer Overhead Ejector Condenser	6/22/95	DT-302	O2-1
DD-305	Filter Cake Reslurry Drum	6/22/95	DT-302	O2-1
DT-111	High Pressure Absorber**	6/22/95	CR#2-HPVGT	O2-3/4
DB-1813	HPVGT Fired Heater	6/22/95	None	O2-2
DT-403	Dehydration Tower	~~6/22/95~~2014	~~CR#2-HPVGT~~ DT-302 (HON Recovery Device)	~~O2-3/4~~ O2-1[MAD21]
DR-106 A/B	Reactors	6/22/95	CR#2-HPVGT	O2-3/4
DD-201	1st Crystallizer	6/22/95	CR#2-HPVGT	O2-3/4
DF-500A/B	OX Feed Silos to PTA	6/22/95	DT-500	O2-5
~~DD-412~~	~~CRU Extraction Drum~~	~~6/22/95~~	~~None~~	~~O2-6~~[MAD22]
~~DD-413~~	~~CRU Waste Slurry Drum~~	~~6/22/95~~	~~None~~	~~O2-7~~[MAD23]
~~DD-414~~	~~CRU Mother Liquor Drum~~	~~6/22/95~~	~~None~~	~~O2-8~~[MAD24]

TABLE 5.5 UNIT ID 05 – Cooper River #2 Oxidation Unit				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
~~DE-390~~	~~CRU Evaporation Drum~~	~~6/22/95~~	~~DE-416~~	~~O2-9~~[MAD25]

~~**The CR#2 Dehydration tower is subject to the requirements of Sub part G of part 40 CFR 63. BP has elected to comply with Subpart G by first routing the dehydration Tower emissions through the HPA (recovery device) to the CR#2 HPVGTS, which is a HON Group 1 control device.~~

TABLE 5.6 UNIT ID 06 – Cooper River #2 PTA Unit				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
DD-500/ DH-518	Feed Slurry Drum and Eductor	6/22/95	None	P2-1
DD-601-605	Crystallizers	6/22/95	DM-601/DE-601	P2-2
DD-705	Filter Feed Drum	6/22/95	DM-601/DE-601	P2-2
DD-704	PRU Mother Liquor Flash Drum	6/22/95	DM-601/DE-601	P2-2
DM-702A/B	Filters	2011	N/A	N/A
DM-703/ DM-704	Product Dryers and Vacuum System	6/22/95	None	P2-3
DF-703A	Day Silo	6/22/95	DM-797A	P2-4A
DF-703B	Day Silo	6/22/95	DM-797B	P2-4B
DM-798A	Product Screener	6/22/95	~~DD-799~~[MAD26]~~/~~DM-797A	P2-4A
DM-798B	Product Screener	6/22/95	~~DD-799~~[MAD27]/DM-797B	P2-4B
DD-304	PRU Mother Liquor Cooler	6/22/95	DE-317	P2-9
DD-308	PRU Mother Liquor Drum	6/22/95	None	P2-10
DR-500	Reactor	6/22/95	DM-601/DE-601	P2-2

TABLE 5.7 UNIT ID 07 – Shipping/Loading				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
CP-701A-E	Product Loading Spout	5/03/77	CM-705A	SL-7
CP-701A-E	Product Loading Spout	5/03/77	CM-705B	SL-8
CP-701A-E	Product Loading Spout	5/03/77	CM-705C	SL-9
CF-701A	Shipping Storage Silo A	5/23/77	CM-701A	SL-1
CF-701B	Shipping Storage Silo B	5/23/77	CM-701B	SL-2
CF-701C	Shipping Storage Silo C	5/23/77	CM-701C	SL-3
CF-701D	Shipping Storage Silo D	5/23/77	CM-701D	SL-4
CF-701E	Shipping Storage Silo E	5/23/77	CM-701E	SL-5
CF-677	Intermediate Transfer Tank – **VOID-**	6/22/95	CM-677	SL-11
CF-701F	Shipping Storage Silo F	6/22/95	CM-720A	SL-6A
CF-701F	Shipping Storage Silo F	6/22/95[MAD28]	CM-720B	SL-6B
CP-701F/ 709F	Bulk Truck Loading	6/22/95[MAD29]	CM-722	SL-10

TABLE 5.8 UNIT ID 11 – Utilities Generator, Compressor and Pumps				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**

TABLE 5.8 UNIT ID 11 – Utilities Generator, Compressor and Pumps				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
AM-804 [MAD30]	Emergency Generator #1 (275 kW/0.136 Million Btu/hr)	~~5/03/77~~1/1/79	None	U-3
AC-402 [MAD31]	Emergency Compressor #1 (~~0.136~~1.53 [MAD32]Million Btu/hr)	5/03/77	None	U-4
AG-202B	Emergency Fire Water Pump ~~(20~~0.76 [MAD33]Million Btu/hr)	5/03/77, replaced 3/04	None	U-5
AC-404 [MAD34]	Compressor #2 (8.2 Million Btu/hr)	1997	None	U-6
AG-229 [MAD35]	T-Head FW Pump (~~4.0 Million Btu/hr~~224 BHP)	5/03/77	None	U-7
AM-838 [MAD36]	IT Emergency Generator (5.5 Million Btu/hr)	2002	None	U-8
AG-202C [MAD37]	Emergency Fire Water Pump	2005~~3~~	None	U-9
AG-202D [MAD38]	Emergency Fire Water Pump	2005~~3~~	None	U-10
BM-1201 [MAD39]	Emergency Generator #2	~~5/03/77~~1/1/79	None	~~U-11~~O-17
DM-135 [MAD40]	Emergency Generator #3 (max 800 kW)	~~1997~~12/11/95	None	~~U-12~~O2-10
L-1	(Leased) Compressor #1*	~~1998~~N/A	None	U-13
L-2	(Leased) Compressor #2*	~~1998~~N/A	None	U-14

* Total combined capacity of compressors shall be less than 2350 HP (5.98 Million Btu/hr)

TABLE 5.9 UNIT ID 12 – Tank Farm				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
AF-101	Px Storage Tank (internal floating roof)	1977 (modified 10/92)	None	TK-1
AF-102	Px Storage Tank (internal floating roof)	1977 (modified 10/92)	None	TK-2
AF-103	Px Storage Tank (internal floating roof)	1977 (modified 10/92)	None	TK-6
	Px Unloading station	1977	None	N/A

TABLE 5.10 UNIT ID 13 – Wastewater Treatment				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
AT-750	4 Million Gallon per day CO_2 Stripper	6/22/95	None	WT-10

TABLE 5.10 **UNIT ID 13 – Wastewater Treatment**				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
AM-775	4 Million Gallon per day Anaerobic Reactor	6/22/95	None	WT-11
AM-704A	Aerobic Reactor	5/3/77	None	None
AM-705A	Aerobic Reactor	5/3/77	None	None
AM-705B	Aerobic Reactor	5/3/77	None	None
AF-760	Surge Tank	6/22/95	None	None
~~AF-206A~~	~~88,128 gallon Waste Neutralizing Tank~~	~~5/3/77~~	~~N/A~~	~~None~~
~~AF-206B~~	~~88,128 gallon Waste Neutralizing Tank~~	~~5/3/77~~	~~N/A~~	~~None~~
~~AF-206C~~	~~88,128 gallon Waste Neutralizing Tank~~	~~5/3/77~~	~~N/A~~	~~None~~
AR-751	500, 000 gallon UASB Reactor	2002	None	WT-11
~~AR-754~~ [MAD41]	~~4,000 gallon UASB Seed Storage Tank~~	~~2002~~	~~None~~	~~None~~

TABLE 5.11 **UNIT ID 15 – 390 Million Btu/hr Boiler #~~1~~3**				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
AB-350A	390 Million Btu/hr Boiler #3	2005	Low ~~Nox~~ NOx Burners	U-11

TABLE 5.12 **UNIT ID 16 – 390 Million Btu/hr Boiler #~~2~~ 4**				
Equip ID	**Equipment Description**	**Installation Date**	**Control Device ID**	**Stack ID**
AB-350B	390 Million Btu/hr Boiler #4	2005	Low ~~Nox~~ NOx Burners	U-12

TABLE 5.13 **UNIT ID Insignificant Activity Generators (IAG)**				
Equip ID	**Equipment Description**	**Order Date**	**Control Device ID**	**Stack ID**
AM-819	**Administration Building Emergency Generator**	04/01/05	None	IAG-1
AM-840	**PX Pump Emergency Generator**	07/31/06	None	IAG-2
AM-846	**Main Gate Emergency Generator**	05/01/05	None	IAG-3
AM-847	**Contractor Gate Emergency Generator**	05/01/05	None	IAG-4
AM-848	**T-Head Emergency Generator**	05/01/05	None	IAG-5
AM-849	**WWT Control Room Emergency Generator**	12/01/07	None	IAG-6

D. EMISSION LIMITS AND STANDARDS

Table 5.13 contains summaries of emission unit emission limits and standards.

TABLE 5.13 **EMISSION LIMITS AND STANDARDS**						
Unit ID	**Pollutant/ Standard**	**Limit**	**Reference Method**	**Regulation**	**State Only**	**Condition Number**
All	VOCs	See Permit Condition	18	SC Reg. 61-62.5, Std.5.1	Yes	5.E. 17
~~03~~	~~CO~~	~~1452 lb/hr and 375 TPY~~	~~10B~~	~~SC Reg. 61-62.5, Section II (H)~~	~~No~~	~~5.E.4~~ [MAD42]

TABLE 5.13 EMISSION LIMITS AND STANDARDS						
Unit ID	**Pollutant/ Standard**	**Limit**	**Reference Method**	**Regulation**	**State Only**	**Condition Number**
~~03~~	~~VOCs~~	~~85 lb/hr and 80 TPY~~	~~18~~	~~SC Reg. 61-62.5, Section II (H)~~	~~No~~	~~5.E.4~~ [MAD43]
03	PM_{10}	2.16 lb/hr	201, 201A	SC Reg. 61-62.5, Section II (H)	No	5.E.4
~~03~~	~~VOCs~~	~~40 lb/hr & 80 TPY~~	~~18~~	~~SC Reg. 61-62.5, Section II (H)~~	~~No~~	~~5.E.4~~ [MAD44]
~~03~~	~~CO~~	~~40 TPY~~	~~10B~~	~~SC Reg. 61-62.5, Section II (H)~~	~~No~~	~~5.E.4~~ [MAD45]
~~03~~	~~VOCs~~	~~60 lb/hr & 165 TPY~~	~~18~~	~~SC Reg. 61-62.5, Section II (H)~~	~~No~~	~~5.E.4~~ [MAD46]
~~03~~	~~CO~~	~~380 TPY~~	~~10B~~	~~SC Reg. 61-62.5, Section II (H)~~	~~No~~	~~5.E.4~~ [MAD47]
~~03-06~~	~~VOCs~~	~~1825 TPY~~	~~Method 18 or 25A~~	~~Letter dated November 2, 1998, Construction Permit 0420-0029-CP & SC Reg. 61-62.1, Section II(H)~~	~~No~~	~~5.E.5~~ [MAD48]
~~03-06~~	~~PM (HPVGTS)~~	~~0.5 lb/10^6 Btu~~	~~5~~	~~SC Reg. 61-62.1, Standard No. 3, Section III(I)~~	~~Yes~~	~~5.E.6~~ [MAD49]
~~03-06~~	~~Opacity~~	~~20%~~	~~9~~	~~SC Reg. 61-62.1, Standard No. 3, Section III(I)~~	~~Yes~~	~~5.E.6~~ [MAD50]
~~05~~	~~DRE~~	~~Less than 20 ppmv HAPs (HON regulation)~~	~~18 or 25A~~	~~SC Reg. 61-62.1, Sec. II(H)~~	~~No~~	~~5.E.6~~ [MAD51]
03-06, 12-13	HAPs	See Condition	N/A	40 CFR 63, Subparts A, F, G and H	No	5.E.7, 5.E.10, 5.E.12, 5.E.13
03-04	TRE value	See Condition	Per 40 CFR 63	40 CFR 63.113 (d)	No	5.E.7
03-04	PM	56.0 lbs/hr	5	SC Regulation 61-62.5, Standard No. 4, Sec. VIII	No	5.E.8
03-04	Opacity (all)	20%	9	SC Regulation 61-62.5, Standard No. 4, Section IX	No	5.E.8
~~05-06~~	~~VOC~~	~~215.9 tpy and 49.3 lbs/hr~~	~~N/A~~	~~SC Regulation 61-62.5, Section II (H)~~	~~No.~~	~~5.E.31 [MAD52]~~
05-06	PM	53.67 lbs/hr	5	SC Regulation 61-62.5, Standard No. 4, Sec. VIII	No	5.E.9
05-06	Opacity (all)	20%	9	SC Regulation 61-62.5, Standard No. 4, Section IX	No	5.E.9
05	TOCs (VOCs)	See Condition	N/A	40 CFR 60 Subparts A and III	No	5.E.10
05	TOCs (VOCs)	See Condition	N/A	40 CFR 60 Subparts A and NNN	No	5.E.10

TABLE 5.13 EMISSION LIMITS AND STANDARDS						
Unit ID	**Pollutant/ Standard**	**Limit**	**Reference Method**	**Regulation**	**State Only**	**Condition Number**
05	HAPs	See Condition	18	40 CFR 63 Subpart G	No	5.E.10
~~05~~	~~Halogens~~	~~See Condition~~	~~26~~	~~40 CFR 63 Subpart G~~	~~No~~	~~5.E.10~~ [MAD53]
~~05-06~~	~~VOCs~~	~~See Condition~~	~~N/A~~	~~40 CFR 60 Subparts A and VV~~	~~No~~	~~5.E.10~~ [MAD54]
07	PM	56.25 lbs/hr	5	SC Reg 61-62.5, Standard No. 4, Section VIII	No	5.E.11
07	Opacity	20%	9	SC Reg 61-62.5, Standard No. 4, Section IX	No	5.E.11
07	PM_{10}	1.08 lb/hr (each for Silos CF-701-A-E)	As approved by BAQ	SC Reg. 61-62.1, Sec. II(H)	No	5.E.11
07	PM_{10}	0.48 lb/hr (for Silo CF-701F)	As approved by BAQ	SC Reg. 61-62.1, Sec. II(H)	No	5.E.11
11	Opacity (all)	See Condition	9	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	PM/PM_{10}	See Condition	5	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	SO_2	See Condition	6	SC Reg. 61-62.1, Sec II(H)	No	5.E.14
11	NO_x	See Condition	7	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	CO	See Condition	10	SC Reg. 61-62.1, Sec II(H)	No	5.E.14
11	VOCs	See Condition	25	SC Reg. 61-62.1, Sec. II(H)	No	5.E.14
11	Fuel sulfur content	See Condition	N/A	SC Reg. 61-62.1, Sec II(H)	No	5.E.14
11	Hours of operation	See Condition	N/A	SC Reg. 61-62.1, Sec. II(H), ~~or~~ 40 CFR 63 Subpart ZZZZ or 40 CFR 60 Subpart IIII	No	5.E.14
11	See Condition	See Condition	See Condition	40 CFR 63 Subpart ZZZZ & 40 CFR 60 Subpart IIII	No	5.E.28
~~12~~	~~Opacity (all)~~	~~20%~~	~~9~~	~~SC Reg. 61-62.5, Std. 4, Sec IX~~	~~No~~	~~5.E.15~~
~~13~~	~~Opacity (all)~~	~~20%~~	~~9~~	~~SC Reg. 61-62.5, Std. 4, Section IX~~	~~No~~	~~5.E.16~~
15-16	Opacity	20%	9	40 CFR 60 Subpart Db	No	5.E.20-22
15-16	Opacity	20%	9	SC Reg. 61-62.5, Std.1, Section I	No	5.E.18
15-16	PM	0.6 lbs/10^6 Btu (3 hour average)	5, 5B or 17	SC Reg. 61-62.5, Std.1, Section II	No	5.E.18
15-16	PM/PM_{10}	50.9 TPY, total for both boilers combined (12-month rolling sum)	5, 5B or 17	SC Regulation 61-62.1, Section II.H	No	5.E.19

TABLE 5.13 EMISSION LIMITS AND STANDARDS						
Unit ID	**Pollutant/ Standard**	**Limit**	**Reference Method**	**Regulation**	**State Only**	**Condition Number**
05, 15-16	~~PM~~See Condition	~~0.03 lb/10^6 Btu of heat input, each (30 day average)~~See Condition	~~5~~NA	40 CFR 63 Subpart DDDDD	No	5.E.24-~~26~~[MAD55]
15-16	SO_2	3.5 lbs/10^6 Btu	6 or 6C	SC Reg. 61-62.5, Std.1, Section III	No	5.E.18
15-16	SO_2	733.4 TPY, total for both boilers combined (12-month rolling sum)	6 or 6C	SC Regulation 61-62.1, Section II.H	No	5.E.19
15-16	NO_x	0.10 lb/10^6 Btu, each (30-day rolling average)	NOx monitoring system under 40 CFR 60.48b	40 CFR 60.44.b	No	5.E.20, 5.E.23
15-16	NO_x	317.0 TPY, total for both boilers combined (12-month rolling sum)	7 or 7E	SC Regulation 61-62.1, Section II.H	No	5.E.19
15-16	CO	299.6 TPY, total for both boilers combined (12-month rolling sum)	10	SC Regulation 61-62.1, Section II.H	No	5.E.19
~~15-16~~	~~CO~~	~~400 ppm by volume on a dry basis corrected to a 3 percent oxygen, each (30-day average)~~	~~CO monitoring system under 40 CFR 63 Subpart DDDDD~~	~~40 CFR 63 Subpart DDDDD~~	~~No~~	5.E.24-~~25~~[MAD56]
~~15-16~~	~~Hydrogen Chloride~~	~~0.0005 lb/10^6 Btu of heat input, each~~	~~26~~	~~40 CFR 63 Subpart DDDDD~~	~~No~~	~~5.E.24-26~~[MAD57]
~~15-16~~	~~Used oil~~	~~See Condition~~	~~N/A~~	~~SC Regulation 61-62.1~~	~~Yes~~	~~5.E.29~~ [MAD58]
15-16	NO_x Budget	N/A	N/A	SC Regulation 61-62.96	No	5.E.27
~~03~~	~~VOCs~~	~~Voluntary LDAR Program~~	~~N/A~~	~~SC Regulation 61-62.1, Section II.H~~	~~No~~	~~5.E.30~~ ~~[MAD59]~~
IAG	See Condition	See Condition	See Condition	40 CFR 63 Subpart ZZZZ	No	5.E.32
IAG	See Condition	See Condition	See Condition	40 CFR 60 Subpart IIII	No	5.E.33

The maximum allowable emission limits above are derived from the various Federal and State regulations that govern the operation of this type of source. All applicable facility wide emission limits and corresponding regulations are listed above. Additional operating requirements which may be more stringent than those above are contained in Part 4.0, Part 6.0, and Part 7.0 of this permit.

E. EMISSION UNIT CONDITIONS

Condition Number	Conditions
	Conditions 5.E.1-5.E.3 Voided
5.E.4	For Cooper River #1, emission limitations were established to avoid a PSD review for the project to debottleneck Cooper River #1 and #2 that was approved in Construction Permit Nos. 0420-0029-CJ, CK and CL. Also for Cooper River #1, emission limitations were updated and added_ to avoid a PSD review for the project to complete an emission reduction project that was approved in Construction Permit No. 0420-0029-CP. ~~The maximum allowable CO emission rate from the #1 HPVGTS is 1452 lb/hr and 375 TPY.~~ ~~The maximum allowable VOC emission rate from the #1 HPVGTS is 85 lb/hr and 80 TPY~~[MAD60]~~.~~ The maximum allowable PM_{10} emission rate from the #1 Silo Scrubber is 2.16 lb/hr. ~~The maximum allowable VOC emission rate from the BT-603 LPA is 80 TPY and 40 lb/hr.~~ ~~The maximum allowable CO emission rate from the BT-603 LPA is 40 TPY.~~ ~~The maximum allowable VOC emission rate from the BT-702 DHT Scrubber is 165 TPY and 60 lb/hr.~~ ~~The maximum allowable CO emission rate from the BT-702 DHT Scrubber is 380 TPY~~[MAD61]~~.~~
~~5.E.5~~	~~For Cooper River #1 and #2, a combined emission limitation for VOCs was established to avoid a PSD review at the time of the project approved in 1995 to construct a new purified terephthalic acid (PTA) production process, designated as Cooper River #2. The limit was revised based on PSD review at the time of construction projects in 2000 and 2004. The maximum allowable VOC emission rate is 1825 tons per year; this limit incorporates all VOC limits from previous construction permits. [MAD62]~~
~~5.E.6~~	~~Emission Unit 03-06~~ ~~The following shall apply to the HPVGTS on the units:~~ ~~The permittee shall operate the catalytic oxidizers (BR-1814 and DR-1814) in compliance with the requirements of SC Regulation 61-62.5, Standard No. 3. SC Regulation 61-62.5, Standard No. 3 establishes the maximum allowable emissions of PM of 0.5lb/10^6 Btu to be emitted from the catalytic~~ [MAD63]~~oxidizers and establishes the opacity limitation of 20%.~~ ~~The CR#2 HPVGTS shall be limited to less than 20 ppmv HAPs through its vent, per requirements in the HON. SC Regulation 61-62.1, Section II(H) requires a destruction and removal efficiency (DRE) of 95%; this requirement is satisfied by the HON limit, which is more stringent~~[MAD64]~~.~~

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>5.E.7</td><td>The following emission points in units 03-04 are subject to 40 CFR 63, Subparts A, F, G and H:

Emission Unit ID 03 Cooper River #1: Oxidation Unit

<table>
<tr><th>Equipment ID</th><th>Equipment Description</th><th>Emission Point</th><th>Group Classification</th><th>Stack ID</th></tr>
<tr><td>BT-401</td><td>High Pressure Absorber (Recovery Device for Air Oxidation Reactor~~s~~ ~~and Dehydration Tower~~)[MAD65]</td><td>Process Vent</td><td>Group 2; TRE>4</td><td>N/A</td></tr>
<tr><td>~~BT-702~~
BT-603</td><td>~~Dehydration Tower Scrubber (Recovery Device for Dehydration Tower)~~Low Pressure Absorber (Recovery device for Dehydration Tower system)</td><td>Process Vent</td><td>Group 2; 1<TRE<4</td><td>~~O-23~~O-2[MAD66]</td></tr>
<tr><td>N/A</td><td>Piping Equipment</td><td>Equipment Leak</td><td>N/A</td><td>N/A</td></tr>
</table>

For the Group 2 Process Vent at BT-401 (CR#1 High Pressure Absorber), which includes emissions from the Air Oxidation Reactor~~s~~ (BR-301 A-D) and ~~Dehydration Tower (BT-701/BE-706)-~~Pursuant to 40 CFR 63.113 (e), the permittee shall maintain a TRE greater than 4.0. For the Group 2 Process Vent at BT-~~702~~ 603 (CR#1 ~~Dehydration Tower Scrubber~~Low Pressure Absorber), which includes emissions from Dehydration Tower System including the Dehydration Tower (BT-701~~/BE-706~~) and BT-750 Entrainer Tower-Pursuant to 40 CFR 63.113(d), the permittee shall maintain a TRE greater than 1.0.
For purposes of determining process vent stream flow rate, total organic hazardous air pollutants or total organic carbon concentration or TRE index value, as specified under paragraph (b), (c), or (d) of δ63.115, the sampling site shall be after the last recovery device but prior to the inlet of any control device that is present prior to release to the atmosphere[MAD67].

To determine the TRE index value, the owner or operator shall conduct a TRE determination and calculate the TRE index value according to the procedures in paragraph (d)(1) or (d)(2) of δ63.115 and the TRE equation in paragraph (d)(3) of δ63.115.</td></tr>
<tr><td>5.E.8</td><td>Emission Units 03-04
The permittee shall operate emission units 03 and 04 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the maximum allowable emissions of PM to be emitted from emission units 03 and 04 (combined) and establishes the opacity limitation for emission units 03 and 04. Actual PM emissions from emission units 03 and 04 (combined) shall be less than or equal to the maximum allowable emissions. For each point and fugitive source within emission unit 03 and 04, the opacity shall be limited to 20%.</td></tr>
<tr><td>5.E.9</td><td>Emission Units 05-06
The permittee shall operate emission units 05 and 06 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the maximum allowable emissions of PM to be emitted from emission units 05 and 06 (combined) and establishes the opacity limitation for emission units 05 and 06. Actual PM emissions from emission units 05 and 06 (combined) shall be less than or equal to the maximum allowable emissions. For each point and fugitive source within emission unit 05 and 06, the opacity shall be limited to 20%.</td></tr>
</table>

5.E.10

The following emission points in emissions units 05-06 are subject to 40 CFR 63, Subparts A, F, G and H:

EMISSION Unit ID 05 Cooper River #2: Oxidation Unit

Equipment ID	Equipment Description	Emission Point	Group Classification	Stack ID
DT-111	High Pressure Absorber (Recovery Device for Air Oxidation Reactor~~s and Dehydration Tower~~)	Process Vent	Group ~~1~~2: TRE>4	N/A[MAD68]
DT-302	Low Pressure Absorber (Recovery device for Dehydration Tower System)	Process Vent	Group 2: 1<TRE<4	O2-1[MAD69]
N/A	Piping Equipment (in HAPs Service)	Equipment Leak	N/A	N/A

Per 63.113(d), the owner or operator of a Group 2 process vent having a flow rate greater than or equal to 0.005 standard cubic meter per minute, a HAP concentration greater than or equal to 50 parts per million by volume, and a TRE index value greater than 1.0 but less than or equal to 4.0 shall maintain a TRE index value greater than 1.0 and shall comply with the monitoring of recovery device parameters in §63.114(b) or (c) of this subpart, the TRE index calculations of §63.115 of this subpart, and the applicable reporting and recordkeeping provisions of §§63.117 and 63.118 of this subpart. Such owner or operator is not subject to any other provisions of §§63.114 through 63.118 of this subpart.[MAD70]

~~Per δ63.113(a)(2), the owner or operator of a Group 1 process vent shall reduce emissions of total organic hazardous air pollutants by 98 weight-percent or to a concentration of 20 parts per million by volume, whichever is less stringent. For combustion devices, the emission reduction or concentration shall be calculated on a dry basis, corrected to 3 percent oxygen, and compliance can be determined by measuring either organic hazardous air pollutants or total organic carbon using the procedures in δ63.116~~ [MAD71]~~of Subpart G.~~

~~Per δ63.113(c)(1), if a combustion device is used to comply with δ63.113(a)(2) for a halogenated vent stream, then the vent stream exiting the combustion device shall be ducted to a halogen reduction device. The halogen reduction device shall reduce overall emissions of hydrogen halides and halogen, as defined in δ63.111, by 99 percent or shall reduce the outlet mass of total hydrogen halides and halogens to less than 0.45 kilogram per hour, whichever is less stringent.~~[MAD72]

~~The permittee shall operate the air oxidation reactors in compliance with the requirements of 40 CFR 60, Subpart III. However since the vent is also a HON Group 1 process vent, it is required to comply only with the provisions of 40 CFR 63 Subpart G.~~ [MAD73]

~~The permittee shall operate the dehydration tower in compliance with the requirements of 40 CFR 60, Subpart NNN. However since the vent is also a HON Group 1 process vent, it is required to comply only with the provisions of 40 CFR 63 Subpart G~~[MAD74]~~.~~

~~The following emission points within emission units 05-06 are subject to the requirements of 40 CFR 60~~[MAD75]~~, Subparts A and VV:~~

~~Equip ID~~	~~Equipment Description~~	~~Emission Point~~	~~Group Classification~~	~~Stack ID~~
~~N/A~~	~~Piping Equipment (in VOC Service)~~	~~Equipment Leak~~	~~N/A~~	~~N/A~~

<table>
<tr>
<td>5.E.10a</td>
<td>
The permittee shall operate the air oxidation reactors in compliance with the requirements of 40 CFR 60, Subpart III. Per 60.610 (c), each affected facility that has a total resource effectiveness (TRE) index value greater than 4.0 is exempt from all provisions of this subpart except for §§60.612, 60.614(f), 60.615(h), and 60.615(l). Per 60.612(c), maintain a TRE index value greater than 1.0 without use of VOC emission control devices.[MAD76]
The permittee shall operate the dehydration tower in compliance with the requirements of 40 CFR 60, Per 60.660 (c)(4), each affected facility that has a total resource effectiveness (TRE) index value greater than 8.0 is exempt from all provisions of this subpart except for §§60.662; 60.664 (d), (e), and (f); and 60.665 (h) and (l). Per 60.662 (c), maintain a TRE index value greater than 1.0 without use of VOC emission control devices.[MAD77]
</td>
</tr>
<tr>
<td>5.E.11</td>
<td>
Emission Units 07
The permittee shall operate emission unit 07 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the maximum allowable emissions of PM to be emitted from emission units 07 and establishes the opacity limitation for emission unit 07. Actual PM emissions from emission unit 07 shall be less than or equal to the maximum allowable emissions. For each point and fugitive source within emission unit 07, the opacity shall be limited to 20%.
The permittee shall also comply with the synthetic minor emission limitation for PM_{10} that was established to avoid a PSD review at the time of the construction project approved in 2000 to debottleneck Cooper River #1 and Cooper River #2. The emission limitation is 1.08 lb/hr each for Silos CF-701 (A-E) and 0.48 lb/hr for Silos CF-701F.
</td>
</tr>
<tr>
<td>5.E.12</td>
<td>
The following emission points within emission unit 12 are subject to the requirements of 40 CFR 63, Subparts A, F, G and H:
Emission Unit ID 12- Tank Farm
<table>
<tr><th>Equip ID</th><th>Equipment Description</th><th>Emission Point</th><th>Group Classification</th><th>Stack ID</th></tr>
<tr><td>AF-101</td><td>Px Storage Tank (internal floating roof)</td><td>Storage Tank</td><td>Group 2</td><td>TK-1</td></tr>
<tr><td>AF-102</td><td>Px Storage Tank (internal floating roof)</td><td>Storage Tank</td><td>Group 2</td><td>TK-2</td></tr>
<tr><td>AF-103</td><td>Px Storage Tank (Internal floating roof)</td><td>Storage Tank</td><td>Group 2</td><td>TK-6</td></tr>
<tr><td>N/A</td><td>Px Unloading Station-Piping Equipment</td><td>Equipment Leak</td><td>N/A</td><td>N/A</td></tr>
</table>
For each Group 2 storage vessel that is not part of an emissions average as described in δ63.150 of Subpart G, the owner or operator shall comply with the record keeping requirement in δ63.123(a) of Subpart G and is not required to comply with any other provisions in δ63.119 through δ63.123 of the Subpart.
</td>
</tr>
</table>

<table>
<tr>
<td>5.E.13</td>
<td>

The following emission points within emission unit 13 are subject to the requirements of 40 CFR 63, Subparts A, F, G, and H:

Emission Unit 13-Wastewater Treatment

Equip ID	Equipment Description	Emission Point	Group Classification	Stack ID
AM-775	Anaerobic Reactor	N/A	Group 2	WT-11or~~U-1/U-2~~/U-11/U-12
AM-704A	Aerobic Basin	N/A	Group 2	N/A
AM-705A	Aerobic Basin	N/A	Group 2	N/A
AM-705B	Aerobic Basin	N/A	Group 2	N/A
AR-751	500,000 gallon UASB Reactor	N/A	Group 2	WT-11or~~U-1/U-2/~~U-11/U-12
AF-754	4,000 gallon UASB Seed Storage Tank	N/A	Group 2	N/A

Emission Unit 13-Wastewater Treatment-The process wastewater has been determined (at the point of determination) to be a Group 2 wastewater stream. No further controls are required on this stream. Records of this determination are maintained at the facility.

</td>
</tr>
</table>

5.E.14

Emission Unit 11

The permittee shall operate each generator, compressor, and pump in compliance with the applicable requirements of 40 CFR 63 Subpart ZZZZ, National Emission Standards For Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines or 40 CFR 60 Subpart IIII, NSPS for Stationary Compression Ignition Internal Combustion Engines, as appropriate.

The permittee shall operate each generator, compressor, and pump in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the respective opacity limitations for these units. The opacity limitation for the generators, compressors, and pumps are summarized in the table below.

The allowable operating hours per year and fuel sulfur content (percent sulfur) for each generator, compressor, and pump is summarized in the table below.

Equip ID	Combustion Source	Opacity	PM/PM_{10}	SO_2	NO_x	CO	VOC	No. 2 fuel oil Percent Sulfur	Hrs/yr
AM-804	Emergency Generator #1	40%	N/A	N/A	N/A	N/A	N/A	<0.3%	~~No limits~~ <100**
AC-402	Emergency Compressor #1	40%	N/A	N/A	N/A	N/A	N/A	<0.3%	~~No limits~~ <100**
AG-202B	Emergency Fire Water Pump	~~40%~~ 20%	N/A	N/A	N/A	N/A	N/A	<0.3%	~~No limits~~ <100**
AG-229	T-Head FW Pump	~~40%~~ 20%	N/A	N/A	N/A	N/A	N/A	<0.3%	~~No limits~~ <100**
AG-202C	Emergency Fire Water Pump	20%	N/A	N/A	N/A	N/A	N/A	<0.05%	<250
AG-202D	Emergency Fire Water Pump	20%	N/A	N/A	N/A	N/A	N/A	<0.05%	<250
BM-1201	Emergency Generator #2 (CR#1)	~~40%~~20	N/A	N/A	N/A	N/A	N/A	~~<0.3%~~15 ppm	~~<250~~ <100**
BM-1204	Emergency Generator #4 (CR#1)	20%						15 ppm	<100
DM-135	Emergency Generator #3 (CR#2)	20%	0.368	0.355	5.2	0.20	0.175	<0.05%	<500
AC-404	Emergency Air Compressor #2 (Utility)	20%	0.175	1.165	14.265	0.65	0.60	<0.05%	~~<1,000~~ <500
AM-838	IT Emergency Generator	20%	N/A	N/A	3.64	N/A	N/A	<0.05%	<500
L-1 and L-2	(Leased) Compressors #1 and #2	20%	7.884	13.14	15.33	3.286	2.322	<0.0015% **	8760*

* Total for both compressors

**Non-emergency hours limit per 40 CFR 63 Subpart ZZZZ or 40 CFR 60 Subpart IIII

<table>
<tr><td>~~5.E.15~~</td><td>~~Emission Unit 12~~
~~The permittee shall operate emission unit 12 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the opacity limitation for emission unit 12. The opacity limitation for each point and fugitive emissions source within emission unit 12 is as follows:~~

<table><tr><th>~~Source Description~~</th><th>~~Stack ID. No.~~</th><th>~~Opacity Limitation~~</th></tr><tr><td>~~Px Storage Tank (internal floating roof)~~</td><td>~~TK-1~~</td><td>~~20%~~</td></tr><tr><td>~~Px Storage Tank (internal floating roof)~~</td><td>~~TK-2~~</td><td>~~20%~~</td></tr><tr><td>~~Px Storage Tank (internal floating roof)~~</td><td>~~TK-6~~</td><td>~~20%~~</td></tr></table></td></tr>
<tr><td>~~5.E.16~~</td><td>~~Emission Unit 13~~
~~The permittee shall operate emission unit 13 in compliance with the requirements of SC Regulation 61-62.5, Standard No. 4. SC Regulation 61-62.5, Standard No. 4 establishes the opacity limitation for emission unit 13. The opacity limitation for each point and fugitive emission source within emission unit 13 shall be limited to 20%.~~</td></tr>
<tr><td></td><td>Conditions 5.E.15 and 5.E.16 Voided</td></tr>
<tr><td>5.E.17</td><td>When the “Net Volatile Organic Compound (VOC) Emissions Increase” for any new, modified or altered source exceeds 100 tons per year since June 25, 2004, Best Available Control technology shall be applied to the construction permit.
~~The “Net Volatile Organic Compound (VOC) Emissions Increase” from this facility shall not exceed 100 tons since July 1, 1979. The “Net VOC Emissions Increase” includes any increases and decreases in the actual VOC emissions at the facility that have occurred since July 1, 1979 and are otherwise creditable. Increases in the VOC emissions from these existing sources may be subject to the applicability requirements of SC Regulation 61-62.5, Standard No. 5.1, Best Available Control Technology (BACT)/Lowest Achievable Emission Rate (“LAER”) Applicable To Volatile Organic Compounds.~~</td></tr>
</table>

5.E.18	The permittee shall operate Boiler No. 3 (AB-350A) and Boiler No. 4 (AB-350B) in compliance with the requirements of SC Regulation 61-62.5, Standard No. 1. In accordance with SC Regulation 61-62.5, Standard No. 1 - Emissions from Fuel Burning Operations, Section II - Particulate Matter Emissions, the allowable discharge of particulate matter resulting from the fuel burning operations is 0.6 lbs/10^6 BTU input. In accordance with SC Regulation 61-62.5, Standard No. 1 - Emissions from Fuel Burning Operations, Section III - Sulfur Dioxide Emissions, the maximum allowable discharge of SO_2 resulting from the fuel burning operations is 3.5 lbs/10^6 BTU input. Boiler No. 3 and Boiler No. 4 are permitted to burn only natural gas, No. 2 VLSD (Very Low Sulfur Distillate) fuel oil, and biogas from the Anaerobic reactor or UASB ~~and onsite spec used oil~~ as a fuel. The No. 2 VLSD fuel oil, which is only to be burned during a natural gas supply curtailment, sulfur content shall be less than or equal to 0.5% by weight. The use of any other substances as fuel is prohibited without prior written approval from the Bureau of Air Quality[MAD78]. In accordance with SC Regulation 61-62.5, Standard No. 1, Emissions from Fuel Burning Operations, Boiler No. 3 and Boiler No. 4 shall not discharge into the ambient air smoke which exceeds an opacity of 20%. The twenty (20) percent opacity limit may be exceeded for soot blowing, but may not be exceeded for more than six (6) minutes in a one hour period nor be exceeded for more than a total of twenty-four (24) minutes in a twenty-four (24) hour period. Emissions caused by soot blowing shall not exceed sixty (60) percent opacity. The opacity standards set forth above do not apply during startup or shutdown. The owner/operator shall, to the extent practicable, maintain and operate any source including associated air pollution control equipment in a manner consistent with good air pollution control practices for minimizing emissions. The owner/operator shall, for a period of at least five (5) years maintain a log of the time, magnitude, duration and any other pertinent information to determine periods of startup and shutdown and make these records available to a Department representative upon request. Also see condition 5.E.21 for the opacity requirements for the NSPS regulation.
5.E.19	Boiler No. 3 and Boiler No. 4 are permitted to burn only ~~distillate fuel oil,~~ natural gas, and bio-gas ~~and on-site generated spec used oil~~. They are also permitted to burn distillate fuel oil as a back-up fuel in case of a natural gas supply interruption. The distillate fuel oil will be VLSD fuel oil meeting the definition of "very low sulfur oil" contained in 40 CFR 60.41b, which has a maximum sulfur content of 0.5 percent. Boiler No. 3 and Boiler No. 4 ~~combined~~ are each limited to ~~18,675,000~~2,400,000 gallons of VLSD fuel oil per year. ~~Based on the PTE calculations, this equates to operating each boiler at a maximum of 3,150 hours per year on VLSD fuel oil. Each boiler would be operated on natural gas for the remainder of the year. The on-site generated spec used oil burned in the boilers is subject to a limit of 10,000 gallons per year.~~ The biogas is subject to a limit of 440 x10^6 SCF per year. The use of any other substances is prohibited without prior written approval from the Bureau of Air Quality. The term year in this condition refers to a rolling 12-month sum. The emissions for PM/PM_{10}, SO_2, NO_x, and CO shall be calculated using a 12-month rolling sum. The Synthetic Minor limits (S.C. Regulation 61-62.1, Section [MAD79]II.H) are as stated in Table 5.13.
5.E.20	Boiler No. 3 and Boiler No. 4 are subject to the applicable requirements of 40 CFR 60 Subparts A and Db, New Source Performance Standards for Industrial, Commercial, and Institutional Steam Generating Units. The boilers are gas boilers which will only burn oil infrequently and are limited to less than a [MAD80]10% capacity factor.
5.E.21	Per 40 CFR 60 Subpart Db for opacity, the permittee is limited to an opacity of 20% except for one 6-minute period per hour of 27%. This NSPS opacity standard does not apply during start-up and shutdown~~.~~ and while burning natural gas.
5.E.22	Per §60.~~48b(a)~~13(1)(2), the owner or operator of an affected ~~facility subject to the opacity standard under §60.43b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the opacity of emissions discharged to the atmosphere and record the output of the system.~~ that limits oil burning to a 10% capacity factor and will only burn oil infrequently can monitor opacity according to an approved alternative monitoring plan. BP CR will submit the alternative monitoring plan to the agency [MAD81]for approval.

<table>
<tr><td>5.E.23</td><td>Per 40 CFR 60 Subpart Db, the NO_x limit is 0.10 lb/ 10^6 Btu (for low release rate) and 0.20 lb/10^6 Btu (for high release rate).</td></tr>
<tr><td>5.E.24</td><td>Boiler No. 3, ~~and~~ Boiler No. 4 and 2 HPVGTS heater DB-1813 shall be in compliance with 40 CFR 63 Subpart DDDDD, “National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters” ~~upon start-up of these units~~by the appropriate compliance date in the final regulation. The permittee must submit an Initial Notification ~~not later than 120 days after becoming subject to this subpart~~and Notice of Compliance status containing the information listed in the regulation by the dates stated in the regulation. ~~The Initial Notification must include the information required in §63.7545, as applicable.~~ The permittee shall be in compliance with the emission limits and the work practice standards in this subpart at all times. ~~except during periods of~~ [MAD82]~~startup, shutdown and malfunction.~~</td></tr>
<tr><td>~~5.E.25~~</td><td>~~New or reconstructed boilers and process heaters in one of the liquid fuel subcategories that burn only fossil fuels and other gases and do not burn any residual oil are subject to the emission limits and applicable work practice standards shown below. The permittee is not required to conduct a performance test to demonstrate compliance with the emission limits. The permittee is not required to maintain operating limits to demonstrate continuous compliance with the emission limits.~~ [MAD83]

<table>
<tr><th>~~Pollutant~~</th><th>~~MACT~~</th><th>~~Limit~~</th></tr>
<tr><td>~~Particulate Matter~~</td><td>~~No control required~~</td><td>~~0.03 lb/10^6 Btu of heat input~~</td></tr>
<tr><td>~~Hydrogen Chloride~~</td><td>~~No control required~~</td><td>~~0.0005 lb/10^6 Btu of heat input~~</td></tr>
<tr><td>~~Carbon Monoxide~~</td><td>~~CEMS required~~</td><td>~~400 ppm by volume on a dry basis corrected to 3 percent oxygen (30-day average)~~</td></tr>
</table></td></tr>
<tr><td>~~5.E.26~~</td><td>~~To demonstrate initial compliance for PM and HCl, the permittee must include a signed statement in the NOCS report required in §63.7545(e) that indicates the facility burns only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels~~[MAD84]~~.~~</td></tr>
<tr><td>5.E.27</td><td>Per S.C. Regulation 61-62.96, Boiler No. 3 and Boiler No. 4 will be NO_x Budget units as they will commence operation after January 1, 1999 and have a maximum design heat input greater than 250 x10^6 Btu/hr.</td></tr>
<tr><td>5.E.28</td><td>The facility is subject to the applicable requirements of 40 CFR 63 Subpart ZZZZ, National Emission Standards For Hazardous Air Pollutants For Stationary Reciprocating Internal Combustion Engines.
The facility is also subject to the applicable requirements of 40 CFR 60 Subpart IIII, NSPS for Stationary Compression Ignition Internal Combustion Engines.</td></tr>
<tr><td>~~5.E.29~~</td><td>~~The content of the on-site generated spec used oil shall meet the definition of used oil as defined by~~ [MAD85]~~Section I, definition 83, of SC Regulation 61-62.1.~~</td></tr>
<tr><td></td><td>Conditions 5.E.29, 5.E.30 and 5.E.31 Voided</td></tr>
<tr><td>5.E.30</td><td>~~The facility shall implement a VOC LDAR (Leak Detection and Repair Program) equivalent to the requirements of 40 CFR 60 Subpart VV (per the regulation as of November 1, 2006) and submit to the Department before placing construction permit 0420-0029-CR into operation. The use of the LDAR program was voluntarily used for the purpose of a PSD offset~~[MAD86]~~.~~</td></tr>
<tr><td>~~5.E.31~~</td><td>~~For Cooper River #2, emission limitations were established to avoid a PSD review for the project to construct Cooper River #2 that was approved in Construction Permit Nos. 0420-0029-CF. The maximum allowable VOC emission rate from the #2 OX and PTA units is 215.9 tpy and 49.3 lbs/hr.~~[MAD87]</td></tr>
</table>

5.E.32	Insignificant Activity Generators The permittee shall operate each generator, compressor, and pump in compliance with the requirements of 40 CFR 63 Subpart ZZZZ. The respective requirements for AM-819, AM-846, AM-847, and AM-848 are summarized below.

Requirement	Limit
Hours of operation per year for maintenance checks and readiness testing	100 hrs/yr
Minimize the engine's time spent at idle and engine's startup time	Minimize to a period needed for appropriate and safe loading of the engine, not to exceed 30 minutes
Work Practices	Change oil & filter every 500 hours, Inspect air cleaner every 1,000 hours, Inspect/Replace as necessary hose & belt every 500 hours or do these annually; whichever comes sooner.
Operate & maintain per plan	Must operate and maintain according to the manufacturer's emission related written instructions or develop your own maintenance plan which must provide to the extent practicable for the maintenance and operation of the engine in a manner consistent with good air pollution control practice for minimizing emissions

5.E.33	Insignificant Activity Generators The permittee shall operate generators AM-840 and AM-849 in compliance with the requirements of 40 CFR 60 Subpart IIII. The respective requirements are summarized below:

Requirement	Limit
AM-840 meet Table 1 standards in 40 CFR 60 Subpart IIII	HC – 1.0 g/HP-hr NOx – 6.9 g/Hp-hr CO – 8.5 g/HP-hr PM – 0.40 g/HP-hr
Hours of operation per year for maintenance checks and readiness testing	100 hrs/yr
Operate & maintain per plan	Operate and maintain the stationary CI internal combustion engine and control device according to the manufacturer's emission-related written instructions;
AM-849 meet Table 1 Tier 2 standards in 40 CFR 89.112	NMHC + NOx – 7.5 g/KW-hr CO – 5.0 g/KW-hr PM – 0.40 g/KW-hr

PART 6.0 MONITORING AND REPORTING REQUIREMENTS

[SC Regulation 61-62.1, Section II]; [SC Regulation 61-62.70.6(a)(3)(i)(B)]

A. MONITORING AND REPORTING

Table 6.1 contains summaries of the monitoring and reporting required of this facility.

***TABLE 6.1* MONITORING AND REPORTING**

Unit ID	Pollutant/ Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
~~01-14~~ 03-16	Record keeping	See Condition	N/A	N/A	See Condition	6.B.1
~~01-14~~ 03-16	Reporting	See Condition	N/A	N/A	N/A	6.B.3
~~01-14~~ 03-16	VOCs	100 TPY VOC Net Increase	See Condition	See Condition	See Condition	6.B.34
~~01-14~~ 03-16	Source Testing	See Condition	See Condition	See Condition	See Condition	6.B.25
03	CR#1 Ox Unit Production	See Condition	See Condition	See Condition	Semiannual	6.B.7
03-14	Opacity	20%	Visual Inspection	Semiannual	Semiannual	6.B.2
~~03-06~~	~~PM Testing/ Operator Training~~	~~N/A~~	~~See Condition~~	~~See Condition~~	~~See Condition~~	~~6.B.35~~
03	Calculated delta T (CR#1-HPVGTS)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.21, 6.B.24
03	Inlet temperature (CR#1-HPVGTS)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.21, 6.B.24
03	Liquid flow rate (Intermediate Storage Silo Scrubber BT-501)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.20, 6.B.24
~~03~~	~~Water and Acetic Acid Scrubbing Flow Rates (DHT Scrubber)~~	~~See Condition~~	~~Record keeping~~	~~Continuously with daily average~~	~~Semiannual~~	~~6.B.6~~ [MAD88]
~~03~~	~~Acetic Acid Scrubbing Liquid temperature (DHT Scrubber)~~	~~See Condition~~	~~Record keeping~~	~~Continuously with daily average~~	~~Semiannual~~	~~6.B.6~~ [MAD89]
03	BT-603 LPA Top Temperature & scrubbing liquid flow	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.20, 6.B.24
~~03~~	~~Condenser (BE-645)~~	~~See Condition~~	~~Record keeping~~	~~Daily~~	~~Semiannual~~	~~6.B.19~~ [MAD90]
03	TRE Value (HPA)	> 4	Record keeping	See Condition	See Condition	6.B.8, 6.B.9

TABLE 6.1 MONITORING AND REPORTING						
Unit ID	**Pollutant/ Parameter**	**Limit**	**Required Monitoring**	**Monitoring Frequency**	**Reporting Frequency**	**Condition Number**
03	TRE Value (~~DHT Scrubber Outlet~~LPA Outlet)	Greater than 1 and less than 4	Record keeping	See Condition	Semiannual	6.B.8, 6.B.9 [MAD91]
03	(HPVGTS) VOCs, CO	See Condition	Stack test	Biennial	Biennial	6.B.25
03	LPA (VOCs, CO)	See Condition	Stack test	Biennial	Biennial	6.B.25
~~03~~	~~DHT Scrubber (VOCs, CO)~~	~~See Condition~~	~~Stack test~~	~~Biennial~~	~~Biennial~~	~~6.B.25~~ [MAD92]
~~03~~	~~VOCs~~	~~LDAR~~	~~Record keeping~~	~~See Condition~~	~~Semiannual~~	~~6.B.56, 6.B.57 [MAD93]~~
04	Pressure Crystallizer Vent Scrubber (CM-301)	See Condition (CAM)	Record keeping	~~At least once per day~~Daily	Semiannual	6.B.21, 6.B.24
04	Pressure drop (Day Silo Bag Filters CM-603A & B)	See Condition	Record keeping	Daily	Semiannual	6.B.17
04	Pressure drop (Dust Collectors CM-608 A &B)	See Condition	Record keeping	Daily	Semiannual	6.B.17
05	Liquid flow rate (Intermediate Silos Vent Scrubber DT-500)	See Condition	Record keeping	Daily	Semiannual	6.B.18
05	CR#2 Low Pressure Absorber (DT-302)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.22, 6.B.24
~~05~~	~~CR#2 CRU Evaporator Overhead Condenser (DE-416)~~	~~See Condition~~	~~Record keeping~~	~~Daily~~	~~Semiannual~~	~~6.B.19 [MAD94]~~

TABLE 6.1 MONITORING AND REPORTING						
Unit ID	**Pollutant/ Parameter**	**Limit**	**Required Monitoring**	**Monitoring Frequency**	**Reporting Frequency**	**Condition Number**
06	Vent Header Flow (Crystallizer Vent Scrubber DM-601/DE-601)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.23, 6.B.24
06	Pressure drop (Day Silo Dust Collectors DM-797 A/B)	See Condition	Record keeping	Daily	Semiannual	6.B.17
~~05-06~~	~~Inlet temperature (CR#2-HPVGTS)~~	~~See Condition (HON)~~	~~Record keeping~~	~~Continuously with daily average~~	~~Semiannual~~	~~6.B.10-6.B.16~~ [MAD95]
~~05-06~~	~~Calculated ΔT (CR#2-HPVGTS)~~	~~See Condition (HON)~~	~~Record keeping~~	~~Continuously with daily average~~	~~Semiannual~~	~~6.B.10-6.B.16~~ [MAD96]
~~05-06~~	~~(CR#2 HPVGTS) Effluent pH~~	~~See Condition (HON)~~	~~Record keeping~~	~~Continuously with daily average~~	~~Semiannual~~	~~6.B.10-6.B.16~~ [MAD97]
~~05-06~~	~~Liquid to gas ratio (gallons/scf) (CR#2-HPVGTS)~~	~~See Condition (HON)~~	~~Record keeping~~	~~Continuously with daily average~~	~~Semiannual~~	~~6.B.10-6.B.16~~ [MAD98]
05-06	Calculated delta T (CR#2 HPVGTS)	~~CAM Presumptive Monitoring (HON)~~See condition CAM	~~See HON monitoring~~ Recordkeeping	Continuously with daily average ~~See HON monitoring~~	~~See HON monitoring~~ Semiannual	6.B.22, 6.B.24 [MAD99]
05	Inlet temperature (CR#2-HPVGTS)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.22, 6.B.24 [MAD100]
05	HPVGTS (VOCs)	See Condition	Record keeping	~~Biennial~~ 36 months	~~Biennial~~36 months	6.B.25
03-06	VOCs	Less than 1825 TPY	See Condition	See Condition	See Condition	6.B.26 [MAD101]
~~05-06~~	~~VOCs~~	~~See Condition~~	~~See Condition~~	~~See Condition~~	~~See Condition~~	~~6.B.~~33 [MAD102]
07	Pressure drop (Loading spout dust collectors CM-705A, B & C)	See Condition	Record keeping	Daily	Semiannual	6.B.17

TABLE 6.1 MONITORING AND REPORTING						
Unit ID	**Pollutant/ Parameter**	**Limit**	**Required Monitoring**	**Monitoring Frequency**	**Reporting Frequency**	**Condition Number**
07	Pressure drop (Truck Loading Dust collectors CM-722)	See Condition	Record keeping	Daily	Semiannual	6.B.17
07	Pressure drop (Shipping Storage Silo Dust collectors CM-701 A-E)	See Condition	Record keeping	Daily	Semiannual	6.B.17
07	Pressure drop (Shipping Storage Silo Dust collectors CM-720 A/B)	See Condition (CAM)	Record keeping	Continuously with daily average	Semiannual	6.B.23, 6.B.24
11	Hours of operation	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28
11	Fuel sulfur content	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28
IAG	Hours of operation	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28
IAG	Fuel sulfur content	See Condition	See Condition	See Condition	Semiannual	6.B.27, 6.B.28
03-06, 12	HAPs	Per 40 CFR 63.112	Record keeping	See Condition	See Condition	6.B.29, 6.B.31-6.B.34
13	HAPs	Per 40 CFR 63.112	Record keeping	See Condition	See Condition	6.B.30
~~15-16~~	~~Opacity~~	~~20%~~	~~COMS Source test (Based on NSPS Subpart Db)~~	~~Continuous Initial and annual RATA test~~	~~Quarterly within 30 days of test~~	~~6.B.39~~ ~~[MAD103]~~
15-16	PM (fuel oil consumption)	~~18,675,000~~ 2,400,000 gallons per year each boiler	Record keeping	Daily	Semiannual	6.B.36 [MAD104]
15-16	fuel oil sulfur content	0.5% sulfur by weight	Record keeping	Daily	Semiannual	6.B.36, 6.B.45, 6.B.46
15-16	PM	0.6 lb/10^6 Btu of heat input each (3- hour average)	fuel supplier certification, and fuel oil consumption records will be maintained	Daily	Semiannual	6.B.36

TABLE 6.1 MONITORING AND REPORTING						
Unit ID	**Pollutant/ Parameter**	**Limit**	**Required Monitoring**	**Monitoring Frequency**	**Reporting Frequency**	**Condition Number**
~~15-16~~	~~PM~~	~~50.9 TPY (for both boilers combined-12 month rolling sum)~~	~~Calculate a twelve-month rolling sum using stack test data, sulfur content, and fuel consumption records.~~	~~Monthly~~	~~Semiannual~~	~~6.B.37~~ [MAD105]
~~15-16~~	~~PM~~	~~50.9 TPY (for both boilers combined-12 month rolling sum)~~	~~Initial then biennial PM stack tests~~	~~Initial then biennial~~	~~Biennial~~	~~6.B.38~~ [MAD106]
~~15-16~~	~~PM_{10}~~	~~50.9 TPY (for both boilers combined-12 month rolling sum)~~	~~Initial then biennial PM stack tests~~	~~Initial then biennial~~	~~Biennial~~	~~6.B.38~~ [MAD107]
~~15-16~~	~~PM~~	~~0.03 lb/10^6 Btu of heat input each (3-hr average)~~	~~Record keeping~~	~~Daily~~	~~NOCS submittal then Semiannual~~	~~6.B.47~~ [MAD108]
15-16	SO_2	3.5 lb/10^6 Btu of heat input each (24-hour average)	fuel supplier certification, and fuel oil consumption records will be maintained	Daily	Semiannual	6.B.36
~~15-16~~	~~SO_2~~	~~733.4 TPY (for both boilers combined-12 month rolling sum)~~	~~An initial stack test only, fuel supplier certification, and fuel oil consumption records will be maintained~~	~~Monthly~~	~~Semiannual~~	~~6.B.37, 6.B.38~~ [MAD109]
15-16	NO_x	0.10 lb/10^6 Btu of heat input (30 day average)	Continuous nitrogen oxides monitor will be installed for NOx-SIP call these monitors can also be used to meet the NSPS requirements for NOx	Continuous (30 day average)	Quarterly	6.B.40, 6.B.41-6.B.44
15-16	NO_X	317.0 TPY for both boilers combined (12-month rolling sum)	Calculate a twelve-month rolling sum using stack test data	Monthly	Semiannual	6.B.37

TABLE 6.1 MONITORING AND REPORTING						
Unit ID	Pollutant/ Parameter	Limit	Required Monitoring	Monitoring Frequency	Reporting Frequency	Condition Number
~~15-16~~	~~CO~~	~~299.6 TPY, for both boilers combined (12-month rolling sum)~~	~~Calculate a 12-month rolling sum using stack test or Continuous Emissions Monitoring System~~	~~Monthly~~	~~Semiannual~~	~~6.B.37~~
~~15-16~~	~~CO~~	~~400 ppm by volume on a dry basis corrected to a 3% oxygen (30-day average)~~	~~CO continuous monitoring is required by the Boiler MACT Standard~~	~~Continuous (30-day average)~~	~~NOCS submittal then semiannual~~	~~6.B.49-6.B.50~~
~~15-16~~	~~Hydrogen Chloride~~	~~0.0005 lb/10^6 Btu of heat input (30-day average)~~	~~Fuel mixture monitoring~~	~~Initial compliance demonstration and monthly monitoring~~	~~Semiannual~~	~~6.B.47-6.B.48~~ ~~[MAD110]~~
15-16	NO_X, heat input, flow	As specified	CEMS	Continuous during control period	Quarterly	6.B.51-6.B.54
~~15-16~~	~~Used oil~~	~~See Condition~~	~~See Condition~~	~~Used oil analysis~~	~~Semiannual~~	~~6.B.4, 6.B.5~~ [MAD111]
Facility-wide	Temporary units	See condition	See Condition	See Condition	See Condition	6.B.55

N/A = Not Applicable

B. MONITORING AND REPORTING CONDITIONS

Condition Number	Conditions
6.B.1	Emission Unit 01-14 Unless otherwise specified in a more specific requirement, all monitoring shall be performed as follows: a. For control devices that have a monitoring frequency specified as “continuously with daily average”, at least one data point shall be obtained each 15-minute period and all data points collected within a 24-hour period (during those times that the process or emissions generating equipment was being operated) shall be averaged together for a daily reading for comparison to an established monitoring range. b. For control devices that have a monitoring frequency specified as “daily reading”, at least one reading will be taken in a 24-hour period (during a time that the process or emissions generating equipment was operating) for comparison to an established monitoring range. However, more than one reading may be taken in a 24-hour period (during a time that the process or emission generating equipment was operating) and all readings taken in the 24-hour period shall be averaged together for a daily reading for comparison to an established parameter.

Condition Number	Conditions
6.B.2	To assure compliance with the opacity limitations, the permittee shall comply with the following requirement: The permittee shall perform a visual inspection on a semiannual basis. Visual Inspection means a qualitative observation of opacity during daylight hours where the inspector records results in a log, noting color, duration, density (heavy or light), cause and corrective action taken for any abnormal emissions. The observer does not need to be certified to conduct valid visual inspections. However, at a minimum, the observer should be trained and knowledgeable about the effects on visibility of emissions caused by background contrast, ambient lighting, and observer position relative to lighting, wind, and the presence of uncombined water. No periodic monitoring for opacity will be required during periods of burning natural gas or propane only. Logs shall be kept to record all visual inspections, including cause and corrective action taken for any abnormal emissions and visual inspections from date of recording. The logs shall be maintained for a period of five (5) years and be made available to the Department upon request. The owner/operator shall submit semiannual reports to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 calendar days after the end of the reporting period.
6.B.3	All records required under this Part 70 operating shall be maintained on site for a period of at least five (5) years and made available to Department personnel upon request. This permit contains compliance certification, testing, monitoring, reporting, and record keeping requirements sufficient to assure compliance with the terms and conditions of this permit. All submittals required by these conditions shall be sent to the South Carolina Department of Health and Environmental Control - Bureau of Air Quality (SC DHEC - BAQ) at the following address: **SC DHEC - BAQ** **Technical Management Section** **2600 Bull Street** **Columbia, SC 29201** The semi-annual monitoring reports required by this permit must be submitted within 60 days of the end of the monitoring period to the above address.
~~6.B.4~~	~~Emission Unit 15-16~~ ~~The content of the on-site generated spec used oil shall meet the definition of used oil as defined by Section I, definition 83, of SC Regulation 61-62.1. A sample of the used oil will be analyzed semiannually for specification used oil metals and sulfur content. A summary of these used oil analyses shall be submitted on an semiannual basis~~[MAD112]~~.~~
~~6.B.5~~	~~Emission Unit 15-16~~ ~~Because of the nature of the waste gas that is routed to the boilers stack testing will not be required for compliance with Standard No. 3 at this time. This is a State only enforceable requirement.~~[MAD113]

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.6</td><td>Unit ID 03
~~For the DHT Scrubber, the owner/operator shall continue to operate, and maintain, liquid flowmeters for the first stage inlet (water), liquid flowmeters for the second stage (acetic acid) and a scrubbing liquid inlet temperature gauge for the second stage as appropriate on each scrubber module. All gauges shall be readily accessible for verification by operating personnel and Department personnel (i.e., on ground level or easily accessible roof level). Each parameter shall be recorded continuously (i.e., at least every fifteen minutes) during source operation and shall be made available to Department personnel upon request. The readings shall be maintained in logs (written or electronic (i.e., computerized data system)), along with any corrective action taken when deviations occur. Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. These ranges may be updated using this procedure, following Bureau approval. Scrubber monitoring data shall be maintained on site for a period of at least five (5) years from the date generated and shall be made available to Department personnel upon request. Each incidence of operation outside these operational ranges, including date and time, cause, and corrective action taken, shall be recorded and kept on site for five (5) years. Exceedance of operational range shall not be considered a violation of an emission limit of this permit, unless the exceedance is also accompanied by other information demonstrating that a violation of an emission limit has taken place. Semiannual reports of these incidences shall be submitted. If no incidences occurred during the reporting period then a letter shall indicate such.~~[MAD114]</td></tr>
<tr><td>6.B.7</td><td>Unit ID 03
The actual monthly production for the CR #1 Ox Unit will be recorded and used to calculate a rolling 12-month sum. These production records, calculations, and calculation results will be submitted on a semi-annual basis. The production rates, along with stack test data, other Bureau approved emission factors and/or control efficiencies and site specific factors will be used to calculate the CO and VOC annual (12-month rolling sum) emissions for the LPA, HPVGTS~~, and the DHT Scrubber~~.[MAD115]</td></tr>
<tr><td></td><td>Condition 6.B.7 Voided</td></tr>
<tr><td>6.B.8</td><td>The Process Vent at BT-401 (CR#1 High Pressure Absorber) shall comply with the applicable monitoring, recordkeeping and reporting requirements of 40 CFR 63.

<table>
<tr><th>Equipment</th><th>Control or Recovery Device</th><th>Group Classification</th><th>TRE Index</th></tr>
<tr><td>Air Oxidation Reactors (BR-301~~ A-D~~)</td><td>CR#1 High Pressure Absorber (Recovery Device)</td><td>2</td><td>Greater than 4.0</td></tr>
<tr><td>Dehydration Tower/Entrainer Tower (BT/701/~~BE-706~~BT-750)</td><td>CR#1 ~~High~~ Low Pressure Absorber (Recovery Device)</td><td>2</td><td>Greater than ~~4.0~~1.0</td></tr>
</table></td></tr>
</table>

Condition Number	Conditions
6.B.9	a. For the Group 2 Process Vent at BT-401 (CR#1 High Pressure Absorber), which includes emissions from the Air Oxidation Reactors (BR-301~~ A-D~~)~~ and Dehydration Tower (BT-701/BE-706)~~ - Pursuant to 40 CFR 63.113 (e), the permittee shall maintain a TRE greater than 4.0 [MAD116]and comply with the following requirements: i. Provisions for calculating TRE index in 40 CFR 63.115. ii. Reporting and record keeping provisions in 40 CFR 63.117(b), 63.118(c), and 63.118(h). b. The owner or operator of a Group 2 process vent with a TRE index greater than 4.0 as specified in §63.113(e), shall maintain records of measurements, engineering assessments, and calculations performed to determine the TRE index value of the vent stream. Documentation of engineering assessments shall include all data, assumptions, and procedures used for the engineering assessments, as specified in §63.115(d)(1). c. The owner or operator who elects to demonstrate compliance with the TRE index value greater than 4.0 under §63.113(e) shall keep up-to-date, readily accessible records of: i. Any process changes as defined in §63.115(e); and ii. Any recalculation of the TRE index value pursuant to §63.115(e). d. Whenever a process change, as defined in §63.115(e), is made that causes a Group 2 process vent with a TRE greater than 4.0 to become a Group 2 process vent with a TRE less than 4.0, the owner or operator shall submit a report within 180 calendar days after the process change. The report may be submitted as part of the next periodic report. The report shall include: i. A description of the process change, ii. The results of the recalculation of the TRE index value required under §63.115(e) and recorded under paragraph (c) of §63.118, and iii. A statement that the owner or operator will comply with the requirements specified in §63.113(d). iv. The owner or operator of a source subject to Subpart G shall submit Periodic Reports. Except as specified under paragraphs (c)(5) and (c)(6) of section §63.152, reports containing information in paragraphs 63.152(c)(2), (c)(3), and (c)(4) shall be submitted semi-annually no later than 60 calendar days after the end of each 6-month period. e. For the Group 2 Process Vent at BT-~~702 ~~603 (CR#1 ~~DHT Scrubber~~Low Pressure Absorber), which includes emissions from the Dehydration Tower (BT-701~~/BE-706~~) and Entrainer Tower (BT-750) - Pursuant to 40 CFR 63.113 (e), the permittee shall maintain a TRE between 1.0 and 4.0 and comply with the following requirements:[MAD117] i. Provisions for calculating TRE index in 40 CFR 63.115. ii. Monitoring of recovery device parameters per provisions of 40 CFR 63.114(b) using the alternate parameters approved by DHEC in a letter of August 11, 2003. iii. Reporting and record keeping provisions in 40 CFR 63.117(b), 63.118(c), and 63.118(h)

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>~~6.B.10~~</td><td>

~~The Control Device CR#2-HPVGTS shall comply with the monitoring, recordkeeping and reporting~~ [MAD118]~~requirements of 40 CFR 63.~~

<table>
<tr><th>~~Equipment~~</th><th>~~Control Device~~</th><th>~~Group Classification~~</th><th>~~Reduction Required~~</th></tr>
<tr><td>~~High Pressure Absorber~~</td><td>~~HPVGTS~~</td><td>~~1~~</td><td>~~98 weight % or to a concentration of 20 ppm by volume~~</td></tr>
<tr><td>~~Dehydration Tower~~</td><td>~~HPVGTS~~</td><td>~~1~~</td><td>~~98 weight % or to a concentration of 20 ppm by volume~~</td></tr>
<tr><td>~~Reactors DR-106 A/B~~</td><td>~~HPVGTS~~</td><td>~~1~~</td><td>~~98 weight % or to a concentration of 20 ppm by volume~~</td></tr>
<tr><td>~~1st Crystallizer DD201~~</td><td>~~HPVGTS~~</td><td>~~1~~</td><td>~~98 weight % or to a concentration of 20 ppm by volume~~</td></tr>
</table>

</td></tr>
<tr><td>~~6.B.11~~</td><td>

~~The table below is a summary of the monitoring and reporting required for Emission Units 05-06 per 40~~ [MAD119]~~CFR 63:~~

<table>
<tr><th>~~Emission Unit~~</th><th>~~Parameter~~</th><th>~~Monitoring Frequency~~</th><th>~~Averaging time~~</th><th>~~Condition~~</th></tr>
<tr><td>~~05-06~~</td><td>~~Inlet temperature (HPVGTS oxidizer)~~</td><td>~~Continuously~~</td><td>~~Daily~~</td><td>~~6.B.13-6.B.17~~</td></tr>
<tr><td>~~05-06~~</td><td>~~Calculated Delta T (HPVGTS oxidizer)~~</td><td>~~Continuously~~</td><td>~~Daily~~</td><td>~~6.B.13-6.B.17~~</td></tr>
<tr><td>~~05-06~~</td><td>~~Effluent pH (HPVGTS scrubber)~~</td><td>~~Continuously~~</td><td>~~Daily~~</td><td>~~6.B.13-6.B.17~~</td></tr>
<tr><td>~~05-06~~</td><td>~~Liquid to gas ratio (gallons/scf) (HPVGTS scrubber)~~</td><td>~~Continuously~~</td><td>~~Daily~~</td><td>~~6.B.13-6.B.17~~</td></tr>
</table>

~~The owner or operator of a HON Group 1 process vent shall reduce emissions of total organic hazardous air pollutants by 98 weight-percent or to a concentration of 20 parts per million by volume, whichever is less stringent. For combustion devices, the emission reduction or concentration shall be calculated on a dry basis, corrected to 3 percent oxygen, and compliance can be determined by measuring either organic hazardous air pollutants or total organic carbon using the procedures in §63.116 of Subpart G.~~

~~Halogenated Group 1process vent streams that are combusted (controlled by combustion control device) shall be ducted to a halogen reduction device, including but not limited to a scrubber, before it is discharged to the atmosphere. The halogen reduction device shall reduce overall emissions of hydrogen halides and halogens, as defined in §63.111 of subpart G, by 99 percent or shall reduce the outlet mass of total hydrogen halides and halogens to less than 0.45 kilogram per hour, whichever is less stringent.~~

</td></tr>
</table>

Condition Number	Conditions
6.B.12	~~Each owner or operator of a HON Group 1 process vent that uses a combustion device to comply with~~ [MAD120]~~the requirements in §63.113 (a)(2) of subpart G, shall install monitoring equipment specified below. All monitoring equipment shall be installed, calibrated, maintained, and operated according to manufacturer's specifications or other written procedures that provide adequate assurance that the equipment would reasonably be expected to monitor accurately.~~ ~~i) For the catalytic oxidizer (DR-1814), temperature-monitoring devices shall be installed in the gas stream immediately before and after the catalyst bed.~~ ~~ii.) For the bromine scrubber (DT-1821), the following monitoring equipment is required for the scrubber:~~ ~~A.) A pH monitoring device equipped with a continuous recorder shall be installed to monitor the pH of the scrubber effluent.~~ ~~B.) A flow meter equipped with a continuous recorder shall be located at the scrubber influent for liquid flow. Gas stream flow shall be determined using one of the procedures specified as follows:~~ ~~1. The owner or operator may determine gas stream flow using the design blower capacity, with appropriate adjustments for pressure drop.~~ ~~2. The owner or operator may prepare and implement a gas stream flow determination plan that documents an appropriate method which will be used to determine the gas stream flow. The plan shall require determination of gas stream flow by a method which will at least provide a value for either a representative or the highest gas stream flow anticipated in the scrubber during representative operating conditions other than start-ups, shutdowns, or malfunctions. The plan shall include a description of the methodology to be followed and an explanation of how the selected methodology will reliably determine the gas stream flow, and a description of the records that will be maintained to document the determination of gas stream flow. The owner or operator shall maintain the plan as specified in §63.103(c).~~
6.B.13	~~The owner or operator of a process vent using a vent system that contains bypass lines that could divert a vent stream away from the control device used to comply with §63.113(a)(2) of subpart G shall comply with the paragraphs shown below. Equipment such as low leg drains, high point bleeds, analyzer vents, open-ended valves or lines, and pressure relief valves needed for safety purposes are not subject to this paragraph.~~ ~~i.) Properly install, maintain, and operate a flow indicator that takes a reading at least once every 15 minutes. Records shall be generated as specified in §63.118(a)(3) of subpart G. The flow indicator shall be installed at the entrance to any bypass line that could divert the vent stream away from the control device to the atmosphere; or~~ ~~ii.) Secure the bypass line valve in the non-diverting position with a car-seal or a lock-and-key type configuration. A visual inspection of the seal or closure mechanism shall be performed at least once every month to ensure that the valve is maintained in the non-diverting position and the vent stream is not diverted through the bypass line.~~ ~~iii.) Maintain a continuous record of valve (by-pass valve) position as a means to determine a by-pass condition. The valves (by-pass valves) are either fully open or fully closed and are not designed to regulate or adjust flow. The positions of the valves (open or closed) can be confirmed on a continuous basis by limit switches via a Distributive Control System (DCS). These limit switches will be maintained~~ [MAD121]~~and tested in accordance with the manufacturer's recommendations.~~

Condition Number	Conditions
~~6.B.14~~	~~Each owner or operator subject to the control provisions for Group 1 vent shall keep an up to date~~[MAD122]~~, readily accessible record of the following data:~~ ~~i.) If any subsequent TRE determinations or performance tests are conducted after the Notification of Compliance Status (NCS) has been submitted, report the data in paragraphs (a)(4) through (a)(8) of §63.117 in the next Periodic Report as specified in §63.152(c) of this subpart.~~ ~~ii.) Record and report the following in the NCS when using a combustion device to achieve a 98 weight percent reduction in organic HAP or an organic HAP concentration of 20 parts per million by volume, as specified in §63.113(a)(2) of this subpart:~~ ~~A.) The parameter monitoring results for catalytic oxidizer (DR-1814) specified in Table 3 of subpart G, and averaged over the same time period of the performance testing.~~ ~~B.) For an incinerator, the percent reduction of organic HAP or TOC achieved by the incinerator determined as specified in §63.116(c) of this subpart, or the concentration of organic HAP or TOC (parts per million by volume, by compound) determined as specified in §63.116(c) of this subpart at the outlet of the incinerator on a dry basis corrected to 3 percent oxygen.~~ ~~iii.) Record and report the following in the NCS when using a scrubber following a combustion device to control a halogenated process vent stream:~~ ~~A.) The percent reduction or scrubber outlet mass emission rate of total hydrogen halides and halogens as specified in §63.116(d) of Subpart G;~~ ~~B.) The pH of the scrubber effluent; and~~ ~~C.) The scrubber liquid to gas ratio; and~~ ~~iv.) Record and report in the NCS the halogen concentration in the process vent stream determined according to the procedures specified in §63.115(d)(2)(v) of subpart G.~~

Condition Number	Conditions
~~6.B.15~~	~~Each owner or operator using a control device to comply with §63.113 (a)(2) of subpart G shall keep the [MAD123]following records up-to-date and readily accessible:~~ ~~i.) Continuous records of the equipment operating parameters specified to be monitored under §63.114(a) of this subpart and listed in table 3 of this subpart or specified by the Administrator in accordance with §63.114(c) and §63.117(e) of this subpart.~~ ~~ii.) Records of the daily average value of each continuously monitored parameter for each operating day determined according to the procedures specified in §63.152(f).~~ ~~iii.) The daily average shall be calculated as the average of all values for a monitored parameter recorded during the operating day, except as provided in paragraph (a)(2)(ii) of §63.118. The average shall cover a 24-hour period if operation is continuous, or the number of hours of operation per operating day if operation is not continuous.~~ ~~iv.) Monitoring data recorded during periods of monitoring system breakdowns, repairs, calibration checks, and zero (low-level) and high-level adjustments shall not be included in computing the hourly or daily averages. Records shall be kept of the times and durations of all such periods and any other periods of process or control device operation when monitors are not operating.~~ ~~v.) The operating day shall be the period from midnight to midnight.~~ ~~vi.) If all recorded values for a monitored parameter during an operating day are within the range established in this Part 70 operating permit, the owner or operator may record that all values were within the range rather than calculating and recording a daily average for that operating day.~~ ~~vii.) Hourly records of whether the flow indicator specified under §63.114(d)(1) of Subpart G was operating and whether flow was detected at any time under the hour, as well as records of the times and durations of all periods when the vent stream is diverted from the control device or the monitor is not operating.~~ ~~viii.) Where a seal mechanism is used to comply with §63.114(d)(2) of subpart G, hourly records of flow are not required. In such cases, the owner or operator shall record that the monthly visual inspection of the seals or closure mechanism has been done, and shall record the duration of all periods when the seal mechanism is broken, the bypass line valve position has changed, or the key for a lock-and-key type lock has been checked out, and records of any car-seal that has broken.~~

Condition Number	Conditions
6.B.16	Each owner or operator who elects to comply with the requirements of §63.113 of this subpart shall submit to the Administrator Periodic Reports semi-annually no later than 60 calendar days after the end of each 6-month period of the following recorded information according to the schedule in §63.152 of this subpart: i. Reports of daily average values of monitored parameters for all operating days when the daily average values recorded under paragraphs (a) and (b) of this section were outside the ranges established in this Part 70 operating permit. ~~ii. For Group 1 points, reports of the duration of periods when~~ [MAD124]~~monitoring data is not collected for each excursion caused by insufficient monitoring data as defined in §63.152(c)(2)(ii)(A) of subpart G.~~ ~~iii. Reports of the times and durations of all periods recorded under paragraph (a)(3) of §63.118 when the vent stream is diverted from the control device through a bypass line.~~ ~~iv. Reports of all periods recorded under paragraph (a)(4) of §63.118 in which the seal mechanism is broken, the bypass line valve position has changed, or the key to unlock the bypass line valve was checked out~~
6.B.17	For 603 A &B, CM-608 A & B, DM-797 A/B, CM-705A, B & C, CM-722, and CM-701 A-E, the owner/operator shall continue to operate and maintain pressure drop gauge(s) on each module of the baghouse(s). Pressure drop readings shall be recorded daily during source operation. Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The facility shall maintain previously established operational ranges for these monitored parameters. The operating ranges may be updated using this procedure, following submittal to the Bureau.
6.B.18	For DT-500, the owner/operator shall continue to operate, and maintain liquid flow meters on each scrubber module. Each parameter shall be recorded daily during source operation. Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The facility shall maintain the established operational ranges for these monitored parameters. The operating ranges may be updated using this procedure, following submittal to the Bureau.
~~6.B.19~~	~~For Condenser BE-645 and CR#2 CRU Evaporator Overhead Condenser (DE-416), the owner/operator~~ [MAD125]~~shall continue to operate and maintain outlet coolant temperature gauges on each condenser. Each parameter shall be recorded daily during source operation.~~ ~~Operational ranges for the monitored parameters have been established to provide a reasonable assurance of compliance. These operational ranges for the monitored parameters were derived from stack test data, vendor certification, and/or operational history and visual inspections, which demonstrate the proper operation of the equipment in compliance. The facility shall maintain the established operational ranges for these monitored parameters. The operating ranges may be updated using this procedure, following Bureau approval.~~

Condition Number	Conditions
6.B.20	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:

Control Device (Emission Unit)	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion	QA/QC Practices
CR#1 Low Pressure Absorber (BT-603)	SC Re. 61-62.1, Sec II (H) ~~(1825 TPY VOC)~~ BACT LIMIT	Scrubbing fluid flow rate and absorber top temperature will be monitored with flow meter and thermocouple	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	> 3.5 gal/min (liquid flow) ≤ 125°F (top temperature)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.	Preventative Maintenance including calibration once every three years
CR#1 Intermediate Storage Silo Scrubber (BT-501)	SC Reg. 61-62.1, Sec. II (H) (2.16 lbs/hr of PM)	Liquid top and bottom flow rates will monitored with flow meters	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	Single Transfer > 18 gallons per minute (top water spray) > 120 gallons per minute (bottom water spray) Double Transfer > 90 gallons per minute (top water spray) > 95 gallons per minute (bottom water spray)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.	Preventative Maintenance including calibration once every three years

All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).

These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.

Condition Number	Conditions
6.B.21	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:

Control Device (Emission Unit 03)	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion	QA/QC Practices
High Pressure Vent Gas Treatment System CR#1 (non-HON source)	SC Reg. 61-62.1 Section II (H) CO limit of ~~1452 lbs/hr and 375 TPY~~ BACT limits	Inlet T and delta T across the catalytic oxidizer will be monitored with thermo-couples	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	Inlet temperature and Delta Temperature[1]	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.	Preventative Maintenance including calibration once every three years
CR#1 Crystallizer Vent Scrubber (CM-301)	SC Reg. 61-62.1 Standard No. 4 (56.05 lbs/hr of PM for Emission Units 03-04)	Scrubber pressure will be monitored	Monitor at least once per day	<0.5 inches of water	Occurs when the parameter is outside the approved monitoring range	Preventative Maintenance including calibration once every three years
High Pressure Vent Gas Treatment System CR#1 (non-HON source)	SC Reg. 61-62.1 Section II (H) ~~1825 TPY~~ of VOC for Emission Units 03-06 & HPVGTS VOC ~~limit of 85 lbs/hr and 80 TPY~~ BACT Limits	Inlet T and delta T across the catalytic oxidizer will be monitored with thermo-couples	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	Inlet temperature and Delta Temperature[1]	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.	Preventative Maintenance including calibration once every three years

[1]The catalytic oxidizer shall be operated within the approved temperature range, determined by contemporaneous source test data. Source testing shall be required upon installation of a new catalyst, and at least once per 24-month period thereafter (consistent with Condition 6.B.25) , for the lifetime of the catalyst.

This temperature requirement does not apply during testing itself. On-site records and submitted reports must include appropriate information regarding testing to justify temperature abnormalities during testing. Failure to include this information will nullify this exception.

If a source test fails or the data is otherwise compromised, the previous successful source test data shall be used to determine the acceptable temperature range. A new source test shall be performed as soon as practicable, in accordance with the testing frequency requirement.

All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).

These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.

Condition Number	Conditions
6.B.22	To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:

Control Device (Emission Unit)	Applicable Requirement	Indicator and Indicator Location	Monitoring & Reporting Frequency	Range	Excursion	QA/QC Practices
CR#2 Low Pressure Absorber (DT-302)	SC Re. 61-62.1, Sec II (H) ~~(1825 TPY VOC for Emission Units 03-06)~~ BACT Limit	Scrubbing fluid flow top and bottom will be monitored with flow meters.	The top and bottom fluid flows will be monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.	> 1 gpm (top water reflux) > 23 gpm (bottom acid reflux)	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.	Preventative Maintenance including calibration once every three years [MAD126]
High Pressure Vent Gas Treatment System CR#2	SC Reg. 61-62.1 Section II (H) 1825 TPY of VOC for Emission Units 03-06	Inlet T and delta T across the catalytic oxidizer will be monitored with thermo-couples~~Presumptive CAM monitoring (HON)~~	Monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.~~Presumptive CAM monitoring (HON)~~	Inlet temperature and Delta Temperature ~~Presumptive CAM monitoring (HON)~~	Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.~~Presumptive CAM monitoring (HON)~~	Preventative Maintenance including calibration once every three years~~Presumptive CAM monitoring (HON)~~ [MAD127]

All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).

These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.23</td><td>
To meet the requirements of 40 CFR 64 the owner/operator shall install, operate and maintain the indicators shown below as the measurement approach:
<table>
<tr><th>Control Device (Emission Unit)</th><th>Applicable Requirement</th><th>Indicator and Indicator Location</th><th>Monitoring & Reporting Frequency</th><th>Range</th><th>Excursion</th><th>QA/QC Practices</th></tr>
<tr><td>CR#2 Crystallizer Vent Scrubber (DM-601/DE-601)</td><td>SC Reg. 61-62.5 Standard No. 4 (53.67 lbs/hr of PM for Emission Units 05-06)</td><td>Scrubber fluid flow rate will be monitored with a flow meter.</td><td>The fluid flow rates will be monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.</td><td>> 180 gallons per minute</td><td>Occurs when the daily monitoring parameter is outside the approved monitoring range or when no valid monitoring value is recorded for either parameter when either A or B has been in operation for at least four hours that day.</td><td>Preventative Maintenance including calibration once every three years</td></tr>
<tr><td>S & L Shipping Storage Silo Bag-houses (CM-720 A/B-F Silo))</td><td>SC Reg. 61-62.5 Standard No. 4 (56.25 lbs/hr of PM for Emission Unit 07</td><td>Pressure drop will be monitored with a differential pressure gauge on each baghouse</td><td>The pressure drop will be monitored continuously and recorded at least once per 15-minutes. A daily average will be calculated from all valid 15-minute monitoring periods and recorded.</td><td>0.2-10 in of water</td><td>Occurs when the daily average for the parameter is outside the approved monitoring range or when the number of valid monitoring periods for the parameter is less than 75% of the number of process operating periods in a day.</td><td>Preventative Maintenance including calibration once every three years</td></tr>
</table>
All indicator measuring instruments shall be readily accessible for verification by operating personnel and Department personnel (i.e. on ground level or easily accessible roof level).

These operational ranges for the monitored parameters were derived from stack test data, which demonstrate the proper operation of the equipment in compliance.
</td></tr>
</table>

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.24</td><td>Per 40 CFR 64, an excursion is defined as any operating condition where the indicator is outside of the approved range. Upon detecting an excursion, the owner or operator shall restore operation of the pollutant-specific emissions unit (including the control device and associated capture system) to its normal or usual manner of operation as expeditiously as practicable in accordance with good air pollution control practices for minimizing emissions. The response shall include minimizing any startup, shutdown or malfunction period and taking any necessary corrective actions to restore normal operation and prevent the likely recurrence of the cause of an excursion (other than those caused by excused startup and shutdown conditions).

Any alternative method for monitoring control device performance must be preapproved by the Bureau and shall be incorporated into the permit as set forth in SC Regulation 61-62.70.7.

A semiannual report for monitoring shall include, at a minimum, the information required under § 70.6(a)(3)(iii) and the following information as applicable:

1) Summary information of the number, duration and cause (including unknown cause, if applicable) of excursions, as applicable, and the corrective actions taken;
2) Summary information on the number, duration and cause (including unknown cause, if applicable) for monitor downtime incidents (other than downtime associated with zero span or other daily calibration checks, if applicable);
3) If applicable, a description of the actions taken to implement a Quality Improvement Plan (QIP) during the reporting period as specified in §64.8. Upon completion of a QIP, the owner or operator shall include in the next summary report documentation that the implementation of the plan has been completed and reduced the likelihood of similar levels of excursions occurring.

The owner or operator shall maintain records of monitoring data, monitor performance data, corrective action, and quality improvement plans. Records shall be maintained on site for a period of at least five (5) years from the date generated and shall be made available to Department personnel upon request.</td></tr>
<tr><td>6.B.25</td><td>The following sources shall be stack tested at least every ~~other year~~36 months per the table below:

<table>
<tr><th>Emission Unit</th><th>Source</th><th>Pollutant</th><th>Testing Frequency</th></tr>
<tr><td>03</td><td>HPVGTS</td><td>VOC, CO</td><td>Once every ~~24~~ 36 months</td></tr>
<tr><td>03</td><td>LPA</td><td>VOC, CO</td><td>Once every ~~24~~ 36 months</td></tr>
<tr><td>~~03~~</td><td>~~DHT Scrubber~~</td><td>~~VOC, CO~~</td><td>~~Once every 24 months~~[MAD128]</td></tr>
<tr><td>05</td><td>HPVGTS</td><td>VOC</td><td>Once every ~~24~~ 36 months</td></tr>
</table>

The Bureau must be notified at least two weeks prior to a source test so that a Bureau representative may be present. Source test methodology, to include testing at worst-case conditions, must be approved by the Bureau and comply with SC DHEC Regulation 61-62.1, Section IV-Source Testing.</td></tr>
</table>

Condition Number	Conditions
~~6.B.26~~	~~To assure compliance with the VOC emission limitation, the permittee shall comply with the following requirements:~~ ~~a. Based on the daily production rates, process data (i.e., organic recording device), source test data, and the operation of all recovery and control equipment, the permittee shall calculate and record within fifteen days following a quarter basis the monthly emissions of VOCs and a twelve month rolling sum. The twelve-month rolling sum shall not exceed 1825 TPY. The calculated values shall include the sum of VOC emissions from all uncontrolled and controlled fugitive (i.e. equipment leaks) and point sources plus uncontrolled VOC emission emitted during periods when performing maintenance on any control device.~~ ~~b. When bypassing any control device during periods of malfunctions, the permittee shall comply with permit condition 4.B.6 of this Part 70 operating permit. If repetitive circumstances or causes of malfunctions are detected, a plan for improving the operations and maintenance of the control device shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality to address such causes.~~ ~~c. The VOC calculated total shall be submitted on a semi annual basis.~~[MAD129]
6.B.27	The permittee shall comply with the following requirements: a. The combustion sources included in Condition 6.B.~~31~~ 28 are permitted to burn only #2 virgin fuel oil as a fuel. The sulfur content of the fuel oil burned in each combustion source shall be limited as shown in Condition 6.B.~~31~~28. The use of any other substances as fuel is prohibited without prior written approval from the Bureau of Air Quality. Fuel oil analysis (i.e. supplier certification sheet) shall be obtained for each batch of oil received and stored on site. The supplier certification shall be maintained on-site for five years. b. The operating time of each combustion source shall be limited as shown in Condition 6.B.28 on a twelve-month rolling sum. Per combustion source, the permittee for each month must record the actual operating hour meter reading and the calculated twelve-month rolling sum. The records of actual operating hours shall be maintained on-site for a period of at least five (5) years. c. In regards to compressors L-1 and L-2, the total rated capacity of two or less diesel powered compressors shall be less than or equal to 5.98 million Btu/hr (2350 HP). The permittee shall maintain appropriate records which demonstrate~~s~~ compliance with this condition. These records shall include, but are not limited to, a copy of the manufacturer's information indicating the rated capacity of each compressor. These records shall be maintained on site for a period of at least five (5) years and shall be made available to a Department representative upon request. The permittee shall notify by phone the local EQC District Office at least a day before replacing and/or adding a compressor. A follow-up letter shall be mailed to the Bureau of Air Quality and the local EQC District Office postmarked at least 2 days after replacing and/or adding a compressor indicating the actual date of installation, the rated capacity of each compressor on site, and the total associated emissions of each criteria pollutant in terms of lbs/hr. BP will prepare a semiannual report to summarize the fuel sulfur content and the hours of operation of the emergency generators, compressors, and pumps per Condition 6.B.~~31~~28.

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.28</td><td>
The operating hours and percent sulfur contents for the fuel~~-~~ for the generators, compressors and pumps in Emission Unit 11 and the IAG Informational EU shall be limited as follows:
<table>
<tr><th>Equip ID</th><th>Combustion Source</th><th>No. 2 fuel oil Percent Sulfur</th><th>Hrs/yr (non-emergency operation)</th></tr>
<tr><td>AM-804</td><td>Emergency Generator #1</td><td>~~<0.3%~~15 ppm</td><td>~~No limits~~100</td></tr>
<tr><td>AC-402</td><td>Emergency Compressor #1</td><td>15 ppm~~<0.3%~~</td><td>100~~No limits~~</td></tr>
<tr><td>AG-202B</td><td>Emergency Fire Water Pump</td><td>15 ppm~~<0.3%~~</td><td>100~~No limits~~</td></tr>
<tr><td>AG-229</td><td>T-Head FW Pump</td><td>15 ppm~~<0.3%~~</td><td>100~~No limits~~</td></tr>
<tr><td>AG-202C</td><td>Emergency Fire Water Pump</td><td><0.05%</td><td><250</td></tr>
<tr><td>AG-202D</td><td>Emergency Fire Water Pump</td><td><0.05%</td><td><250</td></tr>
<tr><td>BM-1201</td><td>Emergency Generator #2 (CR#1)</td><td>15 ppm~~<0.3%~~</td><td>100~~<250~~</td></tr>
<tr><td>DM-135</td><td>Emergency Generator #3 (CR#2)</td><td>15 ppm~~<0.05%~~</td><td><500</td></tr>
<tr><td>AC-404</td><td>Emergency Air Compressor #2 (Utility)</td><td>15 ppm~~<0.05%~~</td><td>~~<1,000~~<500</td></tr>
<tr><td>AM-838</td><td>IT Emergency Generator</td><td>15 ppm~~<0.5%~~</td><td><500</td></tr>
<tr><td>L-1 and L-2</td><td>(Leased) Compressors #1 and #2</td><td>15 ppm~~<0.05%~~</td><td>8760*</td></tr>
<tr><td>AM-819</td><td>Administration Building Emergency Generator</td><td>15 ppm</td><td>100</td></tr>
<tr><td>AM-840</td><td>PX Pump Emergency Generator</td><td>15 ppm</td><td>100</td></tr>
<tr><td>AM-846</td><td>Main Gate Emergency Generator</td><td>15 ppm</td><td>100</td></tr>
<tr><td>AM-847</td><td>Contractor Gate Emergency Generator</td><td>15 ppm</td><td>100</td></tr>
<tr><td>AM-848</td><td>T-Head Emergency Generator</td><td>15 ppm</td><td>100</td></tr>
<tr><td>AM-849</td><td>WWT Control Room Emergency Generator</td><td>15 ppm</td><td>100</td></tr>
</table>
• Total for both compressors

Fuel oil analysis (i.e. supplier certification sheet) shall be obtained for each batch of oil received and stored on site. A semi~~n~~annual report shall be prepared to summarize the fuel sulfur content and the hours of operation.
</td></tr>
<tr><td>6.B.29</td><td>Emission Unit No. 12
Each owner or operator of a Group 1 or Group 2 storage vessel shall keep readily accessible records showing the dimensions of a the storage vessel and an analysis showing the capacity of the storage vessel. This record shall be kept as long as the storage vessel retains Group 1 or Group 2 status and is in operation. For each Group 2 storage vessel, the owner or operator is not required to comply with any other provisions of §§63.119 through 63.123 of Subpart G other than those required by this paragraph unless such vessel is part of an emissions average as described in §63.150 of Subpart G.</td></tr>
<tr><td>6.B.30</td><td>HON wastewater generated is all Group 2 wastewater. Records of the Group 2 status determinations must be kept available for inspection. If the status of the wastewater changes to Group 1, the required notification and capture/destruction system will have to be installed.</td></tr>
</table>

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.31</td><td>
Emission Units 03-06, 12
The owner /operator of these units is subject to 40 CFR 63 Subpart H, National Emission Standards for Organic Hazardous Air Pollutants for Equipment Leaks. In accordance with 40 CFR 63, Subparts A & H, the owner /operator shall comply with the requirements of all applicable provisions of these subparts. The table below lists equipment categories subject to the provisions of this subpart and the method used to show compliance. All VOC will be considered as a HAP for purposes of determining the components requiring a monitoring [MAD130]program.
<table>
<tr><th>Emission Unit</th><th>Equipment/Components</th><th>Method of Compliance from 40 CFR 63, Subpart H Provisions</th></tr>
<tr><td rowspan="5">#1 Ox</td><td>Valves in Gas Vapor or Light Liquid Service</td><td>§63.168(b), §63.168(f)</td></tr>
<tr><td>Connectors/ Flanges in Light Liquid Service</td><td>§63.174(a), §63.174(d)</td></tr>
<tr><td>Pumps in Light Liquid Service</td><td>§63.163(b), §63.163(c)</td></tr>
<tr><td>Agitators</td><td>§63.173(a), §63.173(b), §63.173(c)</td></tr>
<tr><td>Relief Valves</td><td>§63.169</td></tr>
<tr><td rowspan="5">#2 Ox</td><td>Valves in Gas Vapor or Light Liquid Service</td><td>§63.168(b), §63.168(f)</td></tr>
<tr><td>Connectors/ Flanges in Light Liquid Service</td><td>§63.174(a), §63.174(d)</td></tr>
<tr><td>Pumps in Light Liquid Service</td><td>§63.163(b), §63.163(c)</td></tr>
<tr><td>Agitators</td><td>§63.173(a), §63.173(b), §63.173(c)</td></tr>
<tr><td>Relief Valves</td><td>§63.169</td></tr>
<tr><td rowspan="4">OSBL</td><td>Valves</td><td>§63.168(b), §63.168(f)</td></tr>
<tr><td>Connectors/ Flanges</td><td>§63.174(a), §63.174(d)</td></tr>
<tr><td>Pumps in Light Liquid Service</td><td>§63.163(b), §63.163(c)</td></tr>
<tr><td>Relief Valves</td><td>§63.169</td></tr>
</table>
</td></tr>
</table>

Condition Number	Conditions
6.B.32	Emission Units 03-06, 12 Pumps in Light Liquid Service Each pump shall be checked by visual inspection each calendar week for indicators of liquids dripping from the pump seal. If there are indications of liquids dripping from the pump seal, a leak is detected. A first attempt at repair shall be made no later than 5 calendar days after the leak is detected. First attempts at repair include, but are not limited to, the following practices where practicable: i. Tightening of the packing gland nuts. ii. Ensuring that the seal flush is operated at design pressure and temperature. Valves in gas/vapor service and in light liquid service When a leak is detected, it shall be repaired as soon as practicable, but no later than 15 calendar days after the leak is detected, except as provided in §63.171. A first attempt to repair shall be made no later than 5 calendar days after each leak is detected. When a leak has been repaired, the valve shall be monitored at least once within the first 3 months after its repair. The monitoring shall be conducted as specified in §63.180b and c as appropriate to determine whether the valve has resumed leaking. Pumps, valves, connectors, and agitators in heavy liquid service; instrumentation systems; and pressure relief devices in liquid service a. Pumps, valves, connectors, and agitators in heavy liquid service, pressure relief devices in light liquid or heavy liquid service, and instrumentation systems shall be monitored within 5 calendar days by the method specified in §63.180(b) if any evidence of a potential leak to the atmosphere is found by visual, audible, olfactory, or any other detection method. If such a potential leak is repaired as required in paragraphs (c) and (d) of this section, it is not necessary to monitor the system for leaks by the method specified in §63.180(b). b. If an instrument reading of 10,000 parts per million or greater for agitators, 5,000 parts per million or greater for pumps handling polymerizing monomers, 2,000 parts per million or greater for pumps in food/medical service or pumps subject to §63.163(b)(iii)(C), or 500 parts per million or greater for valves, connectors, instrumentation systems, and pressure relief devices is measured, a leak is detected. c. When a leak is detected, it shall be repaired as soon as practicable, but not later than 15 calendar days after it is detected, except as provided in §63.171.The first attempt at repair shall be made no later than 5 calendar days after each leak is detected. For equipment identified in paragraph (a) of this section that is not monitored by the method specified in §63.180(b), repaired shall mean that the visual, audible, olfactory, or other indications of a leak to the atmosphere have been eliminated; that no bubbles are observed at potential leak sites during a leak check using soap solution; or that the system will hold a test pressure. d. First attempts at repair include, but are not limited to, the practices described under §§63.163(c)(2) and 63.168(g), for pumps and valves, respectively***Non-Confidential***

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.33</td><td>
~~Emission Unit 05-06~~
~~The owner /operator of these units is subject to 40 CFR 60 Subpart VV, Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry. In accordance with 40 CFR 60, Subparts A & VV, the owner /operator shall comply with the requirements of all applicable provisions of these subparts. The table below lists equipment categories subject to the provisions of this subpart and the method used to show~~ [MAD131]~~compliance.~~
<table>
<tr><th>~~Emission Unit~~</th><th>~~Equipment/Components~~</th><th>~~Method of Compliance from 40 CFR 60, SubpartVV Provisions~~</th></tr>
<tr><td rowspan="7">~~#2 Ox~~</td><td>~~Valves~~</td><td rowspan="7">~~§60.480-489~~</td></tr>
<tr><td>~~Connectors/ Flanges~~</td></tr>
<tr><td>~~Pumps in Light Liquid Service~~</td></tr>
<tr><td>~~Agitators~~</td></tr>
<tr><td>~~Relief Valves (gas/vapor)~~</td></tr>
<tr><td>~~Relief Valves (Liquid)~~</td></tr>
<tr><td>~~Compressors~~</td></tr>
</table>
~~Per 40 CFR 60. 487(c) All semiannual reports to the Administrator shall include the following information, summarized from the information in §60.486:~~

~~(c)(1) Process unit identification.~~

~~(c)(2) For each month during the semiannual reporting period,~~

~~(c)(2)(i) Number of valves for which leaks were detected as described in §60.482(7)(b) or §60.483-2,~~

~~(c)(2)(ii) Number of valves for which leaks were not repaired as required in §60.482-7(d)(1),~~

~~(c)(2)(iii) Number of pumps for which leaks were detected as described in §60.482-2(b) and (d)(6)(i),~~

~~(c)(2)(iv) Number of pumps for which leaks were not repaired as required in §60.482-2(c)(1) and (d)(6)(ii),~~

~~(c)(2)(v) Number of compressors for which leaks were detected as described in §60.482-3(f),~~

~~(c)(2)(vi) Number of compressors for which leaks were not repaired as required in §60.482-3(g)(1), and~~

~~(c)(2)(vii) The facts that explain each delay of repair and, where appropriate, why a process unit shutdown was technically infeasible.~~ *Non-Confidential*

(c)(3) Dates of process unit shutdowns which occurred within the semiannual reporting period
</td></tr>
</table>

Condition Number	Conditions
6.B.34	Emission Units 01-14 Per Standard 5.1, the permittee shall review all new, modified, or altered sources to determine if they would increase net Volatile Organic Compounds (VOC) emissions by more than 100 tpy. If they increase net VOC emission by more than 100 tpy than Lowest Achievable Emission Rate shall be applied to construction or modifications permitted before June 25, 2004. Best Available Control Technology shall be applied to any new construction permit issued on or after June 25, 2004, when the net VOC emissions increase exceeds 100 tpy. ~~To assure non-exceedance of the LAER net increase above 2831 TPY, as defined by SC Regulation 62.5, Standard No. 5.1, the permittee shall use the information required under this Part 70 operating permit, and other applicable information (e.g., emission factors) to calculate and record the actual VOC emissions from the facility on a monthly basis. The emission calculations shall include emissions from, but not be limited to, fugitive sources, process vents, equipment leaks, transfer racks (unloading and loading operations), storage tanks working, filling and breathing losses, combustion sources, and wastewater collection and treatment equipment. Reports including a summary of all recorded parameter values used in the calculations and calculated values shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 calendar days after the end of the reporting period. Record keeping and reporting periods shall be as follows:~~ ~~a. For actual emissions greater than 75 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1, the reporting shall be on a monthly basis.~~ ~~b. For actual emissions greater than 50 tons/year but less than 75 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1, the reporting shall be on a quarterly basis.~~ ~~c. For actual emissions greater than 25 tons/year but less than 50 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1, the reporting shall be on an annual basis.~~ ~~d. For actual emissions less than or equal to 25 tons/year of net increase above 2831 TPY as defined by SC Regulation 62.5, Standard No. 5.1 the reporting shall be on an annual basis.~~ ~~The owner/operator shall notify the Technical Management Section of initial record keeping and reporting frequency within 30 days of the effective date of the permit. The facility shall also notify the Technical Management Section upon any change in frequency due to increases in actual emissions within 10 days of the change. Once a higher record keeping and reporting frequency has been triggered, the facility must continue at the greater frequency but may petition to have the frequency adjusted for cause. These conditions shall not supersede any State or Federal requirements such as National Emission Standards for Hazardous Air Pollutants, unless these conditions would impose a more restrictive limit.~~
6.B.35	Emission Units 03-06 The Department shall waive the periodic particulate matter testing requirements per SC Regulation 61-62.5, Std. 3, Section VIII and the Operator training requirements per SC Regulation 61-62.5, Std. 3, Section IX.

Condition Number	Conditions
6.B.36	Boilers AB-350 A/B (Boiler Nos. 3 and 4 respectively) combined are each permitted to burn ~~18,675,000~~2,400,000 gallons per year of VLSD fuel oil. The owner/operator must record fuel oil consumption daily and calculate yearly fuel oil consumption on a twelve-month rolling sum. Fuel oil sulfur content shall be less than or equal to 0.5 percent by weight. Acceptable fuel oil certification can be ensured by following Department guidance entitled "Guidance For Fuel Oil Certifications" issued on May 19, 2000 and any subsequent revisions. Fuel oil supplier certification shall be obtained for each batch of oil received and stored on site. Records of fuel oil consumption and fuel oil certification shall be maintained on site for a period of at least five (5) years from the date generated and shall be made [MAD132]available to a Department representative upon request. To assure compliance with SC Regulation 61-62.1 Sec II(H) for the 2005 project adding the new boilers, the permittee shall monitor and record the following information: 1. The daily VLSD fuel oil consumption and calculate the rolling twelve month sum 2. The daily natural gas consumption ~~3. The daily used oil consumption and calculate the rolling twelve month sum~~ ~~4.~~3. The daily biogas consumption and calculate the rolling twelve month sum ~~5.~~4. VLSD fuel oil sulfur content shall be $\leq$ 0.5%. The Fuel oil supplier certification shall be obtained for each batch of oil received and stored on site.[MAD133] The above information shall be included in the semi-annual reports. Semiannual reports including fuel oil certification, fuel oil consumption, and all recorded parameters and calculated values shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 calendar days after the end of the reporting period.
6.B.37	The owner/operator shall calculate ~~SO_2,~~ NO_x, ~~CO, PM, PM_{10} and VOC~~ emissions from Boilers AB-350A/B on a twelve-month rolling sum. The calculations shall include ~~sulfur content~~, fuel consumption and Bureau approved emission factors from stack test data, where available. ~~SO_2, NO_x, CO, PM, and PM_{10}, emissions are listed in Section II-A, "Emission Limitations" of this construction permit~~. The twelve month rolling sum will be included in the semiannual report.
~~6.B.38~~	~~Source tests for PM, PM_{10}, and SO_2 on Boilers AB-350A/B will be required. The tests shall be performed within 60 days after achieving maximum production but not later than 180 days after initial start-up. The Bureau must be notified at least two weeks prior to a source test so that a Bureau representative may be present. Source test methodology, to include testing at worst-case conditions, must be approved by the Bureau and comply with SC DHEC Regulation 61-62.1, Section IV Source Testing.~~ ~~Source testing for PM and PM_{10} on Boilers AB-350A/B will be required on a biennial basis after the initial source test. An initial source test will be required for SO_2.~~ ~~RATA testing for the NOx and CO CEM systems will be conducted annually. The Continuous Opacity~~ [MAD134]~~monitor requires an initial certification per 40 CFR 60 Subpart Db.~~

Condition Number	Conditions
6.B.39	Emission Unit 15-16 (Boilers AB-350 A/B) Per §60.48b(a), the owner or operator of an affected facility subject to the opacity standard under §60.43b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the opacity (COMs) of emissions discharged to the atmosphere and record the output of the system. However under 60.13(i)(2), if #2 fuel oil is used "infrequently", then an alternative monitoring plan can be approved as specified. The permittee will submit a request for an alternative monitoring plan[MAD135]. ~~Logs shall be kept to record all periods of excess emissions, periods when 6-minute opacity exceeds the opacity standard, including cause, corrective action taken and preventative actions adopted. The logs shall be maintained for a period of five (5) years and be made available to the Department upon request. The owner/operator shall submit semiannual excess emissions reports within 30 days after the end of the monitoring period.~~ ~~The permittee will provide a COMs on the AB-350 A/B boilers and will not be required to do any visual observations.~~
6.B.40	Per §60.48b(b), the owner or operator of an affected facility subject to the NOx standard under §60.44b shall install, calibrate, maintain, and operate a continuous monitoring system for measuring the NOx (CEMs) emissions discharged to the atmosphere and record the output of the system. RATA testing for the NOx CEM system will be conducted annually.
6.B.41	Per §40.46b(e)(1), for the initial compliance test, nitrogen oxides from the steam generating unit are monitored for 30 successive steam generating unit operating days and the 30-day average emission rates used to determine compliance with the nitrogen oxides emissions standards under §60.44b. The 30-day average emission rate is calculated as the average of all hourly emissions data recorded by the monitoring system during the 30-day test period.
6.B.42	§60.48 states that if the owner or operator has installed a nitrogen oxides emission rate continuous emission monitoring system (CEMS) to meet the requirements of 40 CFR 75 and will continue to meet the ongoing requirements of part 75, that CEMS may be used to meet the requirements of §60.48b, except the permittee shall meet the requirements of §60.49b. S.C. Regulation 61-96.70 states that owners and operators shall comply with the monitoring and reporting requirements as provided in Subpart H Monitoring and Reporting of the NOx Budget Trading Program and in Subpart H of 40 CFR part 75. Data reported to meet the requirements of §60.49b shall not include data substituted using the missing data procedures in subpart D of part 75, nor shall the data have bias adjusted according to the procedures of part 75. The permittee has stated in the permit application that it will operate CEMS in accordance with the Part 75 provisions to measure NO_x emissions discharged from the proposed boilers. RATA testing for the NOx CEM system will be conducted annually.
6.B.43	Per §60.48b(c), the continuous monitoring required shall be operated and data recorded during all period of operation of the affected facility except for continuous monitoring system breakdowns and repairs. Data shall be recorded during calibration checks, and zero and span adjustments.
6.B.44	Per §60.48b(e), the procedures under §60.13 shall be followed for installation, evaluation, and operation of the continuous monitoring systems.
6.B.45	For SO_2, the permittee has elected to maintain records to demonstrate that the affected facility combusts only VLSD oil under §60.42b(j)(2). The permittee shall obtain and maintain at the affected facility fuel receipts from the fuel supplier which certify that the oil meets the definition of distillate oil as defined in §60.41b. Reports shall be submitted semiannually certifying that only VLSD oil meeting this definition [MAD136]was combusted in the affected facility during the reporting period.
6.B.46	Reports for units subject to 40 CFR 60 Subpart Db shall be submitted in accordance with §60.49b Reporting And Recordkeeping Requirements. As stated in §60.49b, the permittee must submit reports on a semiannual basis. The semiannual reports shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 days after the end of the reporting period. The reports may be included in the Title V semi-annual reports.

Condition Number	Conditions
~~6.B.47~~	~~To demonstrate initial compliance for PM and HCl for 40 CFR 63 Subpart DDDDD, the permittee must include a signed statement in the NOCS report required in §63.7545(e) that indicates the facility burns only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels.~~ ~~To demonstrate continuous compliance with the applicable PM and HCl emission limits, the permittee must also keep records that demonstrate that the facility burns only liquid fossil fuels other than residual oils, either alone or in combination with gaseous fuels. For each boiler or process heater subject to an emission limit, the permittee must also keep the records in paragraphs(d)(1) through (5), where applicable of §63.7555.~~ ~~Section 1 of §63.7555states that the permittee must keep records of monthly fuel use by each boiler or~~ [MAD137]~~process heater, including the type(s) of fuel and amount(s) used.~~
~~6.B.48~~	~~The permittee must also include a signed statement in each semiannual compliance report required in §63.7550 that indicates that the facility burned only liquid fossil fuels other than residual oils, either~~ [MAD138]~~alone or in combination with gaseous fuels.~~
~~6.B.49~~	~~Since the facility has an applicable work practice standard for CO and boilers that will be in the large liquid fuel subcategory, a CEMS for CO must be installed, operated, and maintained according to the procedures in paragraphs (a)(1) through (6) of §63.7525 by the compliance date specified in §63.7495.~~ ~~(1) Each CEMS must be installed, operated, and maintained according to Performance Specification (PS) 4A of 40 CFR part 60, appendix B, and according to the site specific monitoring plan developed according to §63.7505(d).~~ ~~(2) The owner/operator must conduct a performance evaluation of each CEMS according to the requirements in §63.8 and according to PS 4A of 40 CFR part 60, appendix B.~~ ~~(3) Each CEMS must complete a minimum of one cycle of operation (sampling, analyzing, and data recording) for each successive 15-minute period.~~ ~~(4) The CEMS data must be reduced as specified in §63.8(g)(2).~~ ~~(5) The owner/operator must calculate and record a 30-day rolling average emission rate on a daily basis. A new 30-day rolling average emission rate is calculated as the average of all of the hourly CO emission data for the preceding 30 operating days.~~ ~~(6) For purposes of calculating data averages, the owner/operator must not use data recorded during periods of monitoring malfunctions, associated repairs, out-of-control periods, required quality assurance or control activities, or when the boiler or process heater is operating at less than 50 percent of its rated capacity. The owner/ operator must use all the data collected during all other periods in assessing compliance.~~ ~~Logs shall be kept to record all periods of deviation/excess emissions, periods when CEM value averaged over appropriate period exceeds the standard, including cause, corrective action taken and preventative actions adopted. The logs shall be maintained for a period of two (2) years and be made available to the Department upon request. The owner/operator shall submit semiannual deviation/excess emissions~~ [MAD139]~~reports within 30 days after the end of the monitoring period.~~ ~~Any period for which the monitoring system is out of control and data are not available for required calculations constitutes a deviation from the monitoring requirements.~~
	Conditions 6.B.47, 6.B.48 and 6.B.49 Voided
6.B.50	~~Per 40 CFR 63 Subpart DDDDD, the facility will comply with the SSM plan requirements as applicable.~~ 40 CFR 63 Subpart DDDDD As stated in §63.7550, the permittee must submit reports on a semiannual basis according to the requirements in §63.7550(b). The semiannual reports shall be submitted to the Manager of the Technical Management Section, Bureau of Air Quality postmarked no later than 30 days after the end of the reporting period.

Condition Number	Conditions
6.B.51	Emission Unit 15-16 (Boilers AB-350 A/B) Per S.C. Regulation 61-62.96, Boilers AB-350 A/B will be NO_x Budget units and the permittee to the extent applicable shall comply with the monitoring and reporting requirements as provided in subpart H of SC Regulation 61-62.96 and in subpart H of 40 CFR part 75. The NO_x authorized account representative shall comply with all record keeping and reporting requirements in SC Regulation 61-62.96.74 and with the requirements of SC Regulation 61-62.96.10(e). Quarterly reports, as specified in SC Regulation 61-62.96.74(d), shall be sent to EPA and to SC DHEC Bureau of Air Quality's Technical Management Section at the addresses listed in Section 1 of this permit. Unless otherwise provided, the owners and operators of the NO_x Budget source and each NO_x Budget unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Department or the EPA. (i) The account certificate of representation for the NO_x authorized account representative for the source and each NO_x Budget unit at the source and all documents that demonstrate the truth of the statements in the account certificate of representation, in accordance with Section 96.13; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new account certificate of representation changing the NO_x authorized account representative. (ii) All emissions monitoring information, in accordance with subpart H of this regulation; provided that to the extent that subpart H of this regulation provides for a 3-year period for record keeping, the 3-year period shall apply. (iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the NO_x Budget Trading Program. (iv) Copies of all documents used to complete a NO_x Budget permit application and any other submission under the NO_x Budget Trading Program or to demonstrate compliance with the requirements of the NO_x Budget Trading Program.
6.B.52	Per S.C. Regulation 61-62.96, the NO_X authorized account representative of each NO_X Budget source required to have a federally enforceable permit and each NO_X Budget unit required to have a federally enforceable permit at the source shall: (i) Submit to the Department a complete NO_X Budget permit application under Section 96.22 in accordance with the deadlines specified in Section 96.21(b) and (c); (ii) Submit in a timely manner any supplemental information that the Department determines is necessary in order to review a NO_x Budget permit application and issue or deny a NO_x Budget permit.

Condition Number	Conditions
6.B.53	This source is subject to SC Regulation 61-62.96, Nitrogen Oxides (NO_x) Budget Trading Program, and shall comply with all applicable provisions. The owners and operators, and to the extent applicable, the NO_x authorized account representative of a NO_x Budget unit, shall comply with the monitoring and reporting requirements as provided in subpart H of SC Regulation 61-62.96 and in subpart H of 40 CFR part 75. For purposes of complying with such requirements, the definitions in SC Regulation 61-62.96.2 and in 40 CFR part 72 section 72.2 shall apply, and the terms "affected unit," "designated representative," and "continuous emission monitoring system" (or "CEMS") in 40 CFR part 75 shall be replaced by the terms "NO_x Budget unit," "NO_x authorized account representative," and "continuous emission monitoring system" (or "CEMS"), respectively, as defined in SC Regulation 61-62.96.2. The NO_x authorized account representative shall comply with all record keeping and reporting requirements in SC Regulation 61-62.96.74 and with the requirements of SC Regulation 61-62.96.10(e). Quarterly reports, as specified in SC Regulation 61-62.96.74(d), shall be sent to EPA and to SC DHEC, Bureau of Air Quality's Technical Management Section at the addresses listed below. **US EPA, Region 4** **Air Enforcement Branch** **61 Forsyth Street** **Atlanta, GA 30303** **SC DHEC - BAQ** **Technical Management Section** **2600 Bull Street** **Columbia, SC 29201** If the NO_x authorized account representative for a NO_x Budget unit subject to an Acid Rain Emission limitation who signed and certified any submission that is made under subpart F or G of 40 CFR part 75 and which includes data and information required under this subpart or subpart H of 40 CFR part 75 is not the same person as the designated representative or the alternative designated representative for the unit under 40 CFR part 72, the submission must also be signed by the designated representative or the alternative designated representative.
6.B.54	Unless otherwise provided, the owners and operators of the NO_x Budget source and each NO_x Budget unit at the source shall keep on site at the source each of the following documents for a period of 5 years from the date the document is created. This period may be extended for cause, at any time prior to the end of 5 years, in writing by the Department or the EPA. (i) The account certificate of representation for the NO_x authorized account representative for the source and each NO_x Budget unit at the source and all documents that demonstrate the truth of the statements in the account certificate of representation, in accordance with Section 96.13; provided that the certificate and documents shall be retained on site at the source beyond such 5-year period until such documents are superseded because of the submission of a new account certificate of representation changing the NO_x authorized account representative. (ii) All emissions monitoring information, in accordance with subpart H of this regulation; provided that to the extent that subpart H of this regulation provides for a 3-year period for record keeping, the 3-year period shall apply. (iii) Copies of all reports, compliance certifications, and other submissions and all records made or required under the NO_x Budget Trading Program. (iv) Copies of all documents used to complete a NO_x Budget permit application and any other submission under the NO_x Budget Trading Program or to demonstrate compliance with the requirements of the NO_x Budget Trading Program.

<table>
<tr><th>Condition Number</th><th>Conditions</th></tr>
<tr><td>6.B.55</td><td>This facility shall be allowed to operate temporary units such as generators, compressors, and other diesel-driven portable units for emergency, overhaul, maintenance, or similar activities that will have a duration of six months or less. These units shall be equipped with hour meter indicators or other method for recording actual hours of use. Emissions from the use of such equipment must be added to the facility wide totals, if applicable. The owner/operator shall, record for each unit: 1) the size of unit, 2) the date the unit brought on site, 3) the date of first use, 4) the total hours operated, 5) the purpose served by unit, 6) the date unit was removed from site, and 7) the emissions from use. The facility shall not be required to notify the Bureau prior to operating these units. Permanent units, including emergency equipment, shall require prior notification and approval by the Bureau and will be shown in the facility's operating permit as permitted, insignificant, or exempt sources. Units used for peak shaving or load reductions cannot be considered emergency generators.</td></tr>
<tr><td>6.B.56</td><td>Emission Unit 03
~~The facility shall implement a VOC LDAR (Leak Detection and Repair Program) equivalent to the~~ [MAD140]~~requirements of 40 CFR 60 Subpart VV (per the regulation as of November 1, 2006) and submit to the Department before placing construction permit 0420-0029-CR into operation. The use of the LDAR program was voluntarily used for the purpose of a PSD offset.~~

~~The owner/operator of these units shall comply with 40 CFR 60 Subpart VV (per regulation as of November 1, 2006), Standards of Performance for Equipment Leaks of VOC in the Synthetic Organic Chemicals Manufacturing Industry. In accordance with 40 CFR 60, Subparts A & VV, the owner /operator shall comply with the requirements of all applicable provisions of these subparts. The table below lists equipment categories subject to the provisions of this subpart and the method used to show compliance.~~
<table>
<tr><th>~~Emission Unit~~</th><th>~~Equipment/Components~~</th><th>~~Method of Compliance from 40 CFR 60, Subpart VV Provisions~~</th></tr>
<tr><td rowspan="7">~~#1 Ox~~</td><td>~~Valves~~</td><td rowspan="7">~~§60.480-489~~</td></tr>
<tr><td>~~Connectors/ Flanges~~</td></tr>
<tr><td>~~Pumps in Light Liquid Service~~</td></tr>
<tr><td>~~Agitators~~</td></tr>
<tr><td>~~Relief Valves (gas/vapor)~~</td></tr>
<tr><td>~~Relief Valves (Liquid)~~</td></tr>
<tr><td>~~Compressors~~</td></tr>
</table>
</td></tr>
</table>

Condition Number	Conditions
~~6.B.57~~	~~Emission Unit 03~~ ~~Per 40 CFR 60 Subpart VV 60.487(a), each owner or operator subject to the provisions of subpart VV~~ [MAD141]~~shall submit semiannual reports to the Bureau (for construction permit beginning six months after the initial start up date(for construction permit CR).~~ ~~(b) The initial semiannual report to the Bureau shall include the following information:~~ ~~**(b)**(1) Process unit identification.~~ ~~**(b)**(2) Number of valves subject to the requirements of §60.482-7, excluding those valves designated for no detectable emissions under the provisions of §60.482-7(f) .~~ ~~**(b)**(3) Number of pumps subject to the requirements of §60.482-2, excluding those pumps designated for no detectable emissions under the provisions of §60.482-2(e) and those pumps complying with §60.482-2(f).~~ ~~**(b)**(4) Number of compressors subject to the requirements of §60.482-3, excluding those compressors designated for no detectable emissions under the provisions of §60.482-3(i) and those compressors complying with §60.482-3(h).~~ ~~(c) All semiannual reports to the Administrator shall include the following information, summarized from the information in §60.486:~~ ~~**(c)**(1) Process unit identification.~~ ~~**(c)**(2) For each month during the semiannual reporting period,~~ ~~**(c)(2)**(i) Number of valves for which leaks were detected as described in §60.482(7)(b) or §60.483-2,~~ ~~**(c)(2)**(ii) Number of valves for which leaks were not repaired as required in §60.482-7(d)(1),~~ ~~**(c)(2)**(iii) Number of pumps for which leaks were detected as described in §60.482-2(b) and (d)(6)(i),~~ ~~**(c)(2)**(iv) Number of pumps for which leaks were not repaired as required in §60.482-2(c)(1) and (d)(6)(ii),~~ ~~**(c)(2)**(v) Number of compressors for which leaks were detected as described in §60.482-3(f),~~ ~~**(c)(2)**(vi) Number of compressors for which leaks were not repaired as required in §60.482-3(g)(1), and~~ ~~**(c)(2)**(vii) The facts that explain each delay of repair and, where appropriate, why a process unit shutdown was technically infeasible.~~ ~~**(c)**(3) Dates of process unit shutdowns which occurred within the semiannual reporting period.~~ ~~**(c)**(4) Revisions to items reported according to paragraph (b) if changes have occurred since the initial report or subsequent revisions to the initial report.~~

<u>ATTACHMENT B</u>

Insignificant Activities

BP Amoco Chemical Company-Cooper River Plant
TV-0420-0029

The following table contains a list of activities which are considered insignificant pursuant to SC Regulation 61-62.70.5(c). Sources listed below are not exempt from any otherwise applicable state or federal requirements including, but not limited to, opacity standards, ambient air quality standards, and air toxic standards.

Equip ID	Source Description	Installation Date/ Modification Date	Basis
IA-5	Facility Maintenance-Process Vessel and Tank Cleaning	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-6	Facility Maintenance-Purging of Natural Gas Lines	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-8	Facility Maintenance – General Vehicle Maintenance and Service Activities including but not limited to Railcars	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-9	Facility Maintenance- Vehicle fueling (diesel & gasoline)	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-10	Facility Maintenance-Metals machining solvents including cutting oils	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-11	Facility Maintenance-Grinding activities	N/A	Emissions total < 5 TPY of PM Emission total < .5 TPY of HAP
IA-12	Facility Maintenance-Catalyst change out/unit turnarounds	N/A	Emissions total < 5 TPY of VOC Emission total < 5 TPY of PM Emission total < .5 TPY of HAP
IA-13	Facility Maintenance-Insulation work	N/A	Emission total < 5 TPY of PM
IA-14	Facility Maintenance-Filter change out	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-19	Wastewater & Stormwater Management-Filter pressing	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-21	Remediation-Vacuum Truck Operations	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-23	Remediation-Stockpiled contaminated soils	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-24	Remediation-Groundwater sampling and level monitoring	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-25	Remediation-Soil Coring	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP

Equip ID	Source Description	Installation Date/ Modification Date	Basis
IA-26	Remediation-Asbestos Abatement	N/A	Emissions total < 5 TPY of PM Emission total < .5 TPY of HAP
IA-43	Lime Storage, Spent Lime, and Clay Handling activities	N/A	Emissions total < 5 TPY of PM Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
IA-44	Fuel Oil and Paraxylene Separators	1977	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
~~IA-47~~			**Should not be listed In Title V permit since on IA list Section A #5**
~~IA-48~~			
IA-57	Herbicide and Insecticide Application Activities	N/A	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
~~IA-58~~			**Should not be listed In Title V permit since on IA list Section A #5**
AF-1001	< 10,000 gallon – Storehouse-Diesel Storage Tank	1992	Insignificant Activity B.3
AF-1000	< 10,000 gallon – Storehouse-Gasoline Storage Tank	1992	Insignificant Activity B.3
AD-206A	Utilities-<2,000 gallon Cooling Tower Additive Tank	2009	Insignificant Activity B.3
AD-206B	Utilities-<2,000 gallon Cooling Tower Additive Tank	2009	Insignificant Activity B.3
AF-211	Utilities-6300 gallon Water Coagulant Tk		Insignificant Activity B.3
AF-306	Utilities-1000 gal Steam Additive Tk		Insignificant Activity B.3
AF-307	Utilities-1000 gallon Boiler Water Additive		Insignificant Activity B.3
AF-309	Utilities-1000 gallon Boiler Water Additive		Insignificant Activity B.3
AF-313	Utilities-<1000 gallon Polymer Additive Tank	1994	Insignificant Activity B.3
DF-901	Utilities-<1000 gallon Polymer Additive Tank	1998	Insignificant Activity B.3
AF-1320	Utilities-1000 gallon Cooling Tower Additive Tank	2004	Insignificant Activity B.3
AF-803	#2 VLSD Fuel Oil Day Storage Tank (TK-5)	1977	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
AT-201	#1 Cooling Tower	1977	Insignificant Activity A.20
AT-202	#2 Cooling Tower	1997	Insignificant Activity A.20
BD-100	230 gallon Chiller Expansion Tank	1989	Insignificant Activity B.3
BD-102	50 gallon Injection Tank	1984	Insignificant Activity B.3
BD-725	1500 gallon DHT Waste Condensate	1996	Insignificant Activity B.3
BD-910	500 gallon Steam Condensate Chemical Storage	1993	Insignificant Activity B.3
BD-911	560 gallon Steam Condensate Chemical	1979	Insignificant Activity B.3
BD-912	560 gallon Steam Condensate Chemical Storage	1993	Insignificant Activity B.3
BD-913	100 gallon Chemical Mix (Steam System Tank)	1997	Insignificant Activity B.3
BD-915	2,000 gallon Steam Condensate Chemical Storage	1997	Insignificant Activity B.3
BF-1402	95,000 gallon Liquid Catalyst Tank	1997	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
BF-1404	6,600 gallon Hydrobromic Acid (HBr)	2004	Non-regulated pollutant
~~BM-1201~~			**Shouldn't be listed in Title V permit**

Non-Confidential

Equip ID	Source Description	Installation Date/ Modification Date	Basis
~~SO-100~~			**since on IA list Section A #18**
BF-713	1050 gallon Lube Oil Reservoir Tank (LPVGT)	1995	Insignificant Activity B.3
CD-501	32,100 gallon Recycle Solvent Drum (Process Water)	1979	Emissions total < 5 TPY of VOC Emission total < .5 TPY of HAP
~~CF-401A~~			**Shouldn't be listed in Title V permit since on IA list Section A #18**
~~CF-401B~~			
~~CF=401C~~			
DF-901	100 gallon Polymer Additive Tk	2008	Insignificant Activity B.3
DF-902	400 gallon Steam Condensate Chemical	2008	Insignificant Activity B.3
DD-913	100 gallon Chemical Mix (Steam System Tank)	1996	Insignificant Activity B.3
AM-840	PX Pump Emergency Generator (230 KW)	07/2006	Insignificant Activity B.2.b
AM-846	Main Gate Emergency Generator (50 KW)	5/2005	Insignificant Activity B.2.a
AM-847	Contractor Gate Emergency Generator (20 KW)	5/2005	Insignificant Activity B.2.a
AM-848	T-Head Emergency Generator (50 KW)	5/2205	Insignificant Activity B.2.a
AM-849	WWT Control Room Emergency Generator (60 KW)	12/2007	Insignificant Activity B.2.a
AM-819	Administration Building Emergency Generator (50 KW)	04/2005	Insignificant Activity B.2.a

N/A = Not Applicable

Appendix F
Federal Land Manager Reply

Doerner, Michael

From: Collins, Catherine <catherine_collins@fws.gov>
Sent: Tuesday, March 12, 2013 2:44 PM
To: Doerner, Michael
Subject: Re: FW: BP Cooper River PSD Permit Application

Thank you for sending the information regarding the project near the Cape Romain National Wildlife Refuge. Based on the emission changes identified in the document and distance from the Class I area(s) listed below, the Fish and Wildlife Service anticipates that modeling would not show any significant additional impacts to air quality related values (AQRV) at the Class I area(s) administered by the FWS. Therefore, we are not requesting that a Class I AQRV analysis be included in the PSD permit application. Our screening of this analysis does not indicate agreement with any AQRV analysis protocols or conclusions applicants may make independent of Federal Land Manager review. Please note that we are specifically addressing the need for an AQRV analysis for Class I areas managed by the Fish and Wildlife Service.

Class I Area:

Cape Romain NWR

Distance to Facility in kilometers

21.6 km

Annual Emissions (based on short term maximum emission rates adjusted to an annual emission rate) in tons per year (tpy)

+ 27.4	Nitrogen Oxides
+ 0.3	Sulfur Oxides
+ 4.7	Total Fine particulate matter
+ 72.6	Volatile organic compounds
+ 439.6	Carbon Monoxide

The state and/or EPA may have a different opinion regarding the need for a Class I increment analysis. Should the emissions or the nature of the project change significantly, please contact me, so that we might re-evaluate the revised proposed project.

Thank you for keeping us informed and involving the Fish and Wildlife Service in the project review.

Catherine Collins, Environmental Engineer
U.S. Fish and Wildlife Service
Air Quality Branch
7333 W. Jefferson Ave., Suite 375
Lakewood, CO 80235-2034

Appendix G
Air Modeling Information

The air modeling information is provided on the attached compact disc.

Appendix H
USEPA Control Technology Fact Sheet – Incinerators

EPA-452/F-03-022

Air Pollution Control Technology Fact Sheet

See Bottom of page 3

Name of Technology: Thermal Incinerator

This type of incinerator is also referred to as a direct flame incinerator, thermal oxidizer, or afterburner. However, the term afterburner is generally appropriate only to describe a thermal oxidizer used to control gases coming from a process where combustion is incomplete.

Type of Technology: Destruction by thermal oxidation

Applicable Pollutants: Primarily volatile organic compounds (VOC). Some particulate matter (PM), commonly composed as soot (particles formed as a result of incomplete combustion of hydrocarbons (HC), coke, or carbon residue) will also be destroyed in various degrees.

Achievable Emission Limits/Reductions:

VOC destruction efficiency depends upon design criteria (i.e., chamber temperature, residence time, inlet VOC concentration, compound type, and degree of mixing) (EPA, 1992). Typical thermal incinerator design efficiencies range from 98 to 99.99% and above, depending on system requirements and characteristics of the contaminated stream (EPA, 1992; EPA, 1996a). The typical design conditions needed to meet 98% or greater control or a 20 parts per million by volume (ppmv) compound exit concentration are: 870°C (1600°F) combustion temperature, 0.75 second residence time, and proper mixing. For halogenated VOC streams, 1100°C (2000°F) combustion temperature, 1.0 second residence time, and use of an acid gas scrubber on the outlet is recommended (EPA, 1992).

For vent streams with VOC concentration below approximately 2000 ppmv, reaction rates decrease, maximum VOC destruction efficiency decreases, and an incinerator outlet VOC concentration of 20 ppmv, or lower may be achieved (EPA, 1992).

Controlled emissions and/or efficiency test data for PM in incinerators are not generally available in the literature. Emission factors for PM in phthalic anhydride processes with incinerators are available, however. The PM control efficiencies for these processes were found to vary from 79 to 96% (EPA, 1998). In EPA's 1990 National Inventory, incinerators used as control devices for PM were reported as achieving 25 to 99% control efficiency of particulate matter 10 microns or less in aerodynamic diameter (PM_{10}) at point source facilities (EPA, 1998). Table 1 presents a breakdown of the PM_{10} control efficiency ranges by industry for recuperative incinerators (EPA, 1996b). The VOC control efficiency reported for these devices ranged from 0 to 99.9%. These ranges of control efficiencies are large because they include facilities that do not have VOC emissions and control only PM, as well as facilities which have low PM emissions and are primarily concerned with controlling VOC (EPA, 1998).

Table 1. Thermal Incinerator PM_{10} Destruction Efficiencies by Industry (EPA, 1996b)

Industry/Types of Sources	PM_{10} Control Efficiency (%)
Petroleum and Coal Products asphalt roofing processes (blowing, felt saturation); mineral calcining; petroleum refinery processes (asphalt blowing, catalytic cracking, coke calcining, sludge converter); sulfur manufacturing	25 - 99.9
Chemical and Allied Products carbon black manufacturing (mfg); charcoal mfg; liquid waste disposal; miscellaneous chemical mfg processes; pesticide mfg; phthalic anhydride mfg (xylene oxidation); plastics/synthetic organic fiber mfg; solid waste incineration (industrial)	50 - 99.9
Primary Metals Industries by-product coke processes (coal unloading, oven charging and pushing, quenching); gray iron cupola and other miscellaneous processes; secondary aluminum processes (burning/drying, smelting furnace); secondary copper processes (scrap drying, scrap cupola, and miscellaneous processes); steel foundry miscellaneous processes; surface coating oven	70 - 99.9
Electronic and Other Electric Equipment chemical mfg miscellaneous processes; electrical equipment bake furnace; fixed roof tank; mineral production miscellaneous processes; secondary aluminum roll/draw extruding; solid waste incineration (industrial)	70 - 99.9
Electric, Gas, and Sanitary Services internal combustion engines; solid waste incineration (industrial, commercial/ institutional)	90 - 98
Stone, Clay, and Glass Products barium processing kiln; coal cleaning thermal dryer; fabricated plastics machinery; wool fiberglass mfg	50 - 95
Food and Kindred Products charcoal processing, miscellaneous; corn processing, miscellaneous, fugitive processing, miscellaneous; soybean processing, miscellaneous	70 - 98
Mining asphalt concrete rotary dryer; organic chemical air oxidation units, sulfur production	70 - 99.6
National Security and International Affairs solid waste incineration (commercial/institutional and municipal)	70
Textile Mill Products plastics/synthetic organic fiber (miscellaneous processes)	88 - 95
Industrial Machinery and Equipment secondary aluminum processes (burning/drying, smelt furnace)	88 -98
Lumber and Wood Products solid waste incineration (industrial)	70
Transportation Equipment solid waste incineration (industrial)	70 - 95

Applicable Source Type: Point

Typical Industrial Applications:

Thermal incinerators can be used to reduce emissions from almost all VOC sources, including reactor vents, distillation vents, solvent operations, and operations performed in ovens, dryers, and kilns. They can handle minor fluctuations in flow, however, excess fluctuations require the use of a flare (EPA, 1992). Their fuel consumption is high, so thermal units are best suited for smaller process applications with moderate-to-high VOC loadings.

Incinerators are used to control VOC from a wide variety of industrial processes, including, but not limited to the following (EPA, 1992):

- Storing and loading/unloading of petroleum products and other volatile organic liquids;
- Vessel cleaning (rail tank cars and tank trucks, barges);
- Process vents in the synthetic organic chemical manufacturing industry (SOCMI);
- Paint manufacturing;
- Rubber products and polymer manufacturing;
- Plywood manufacturing;
- Surface coating operations:
  Appliances, magnetic wire, automobiles, cans, metal coils, paper, film and foil, pressure sensitive tapes and labels, magnetic tape, fabric coating and printing, metal furniture, wood furniture, flatwood paneling, aircraft, miscellaneous metal products;
- Flexible vinyl and urethane coating;
- Graphic arts industry; and
- Hazardous waste treatment storage, and disposal facilities (TSDFs).

Emission Stream Characteristics:

a. **Air Flow:** Typical gas flow rates for thermal incinerators are 0.24 to 24 standard cubic meters per second (sm^3/sec) (500 to 50,000 standard cubic feet per minute (scfm)) (EPA, 1996a).

b. **Temperature:** Most incinerators operate at higher temperatures than the ignition temperature, which is a minimum temperature. Thermal destruction of most organic compounds occurs between 590°C and 650°C (1100°F and 1200°F). Most hazardous waste incinerators are operated at 980°C to 1200°C (1800°F to 2200°F) to ensure nearly complete destruction of the organics in the waste (AWMA, 1992).

a. **Pollutant Loading:** Thermal incinerators can be used over a fairly wide range of organic vapor concentrations. For safety considerations, the concentration of the organics in the waste gas must be substantially below the lower flammable level (lower explosive limit, or LEL) of the specific compound being controlled. As a rule, a safety factor of four (i.e., 25% of the LEL) is used (EPA, 1991, AWMA, 1992). The waste gas may be diluted with ambient air, if necessary, to lower the concentration. Considering economic factors, thermal incinerators perform best at inlet concentrations of around 1500 to 3000 ppmv, because the heat of combustion of hydrocarbon gases is sufficient to sustain the high temperatures required without addition of expensive auxiliary fuel (EPA, 1995).

d. **Other Considerations:** Incinerators are not generally recommended for controlling gases containing halogen- or sulfur-containing compounds, because of the formation of hydrogen chloride, hydrogen fluoride gas, sulfur dioxide, and other highly corrosive acid gases. It may be necessary to install a post-oxidation acid gas treatment system in such cases, depending on the outlet concentration. This would likely make incineration an uneconomical option. (EPA, 1996a). Thermal incinerators are also not generally cost-effective for low-concentration, high-flow organic vapor streams (EPA, 1995).

Emission Stream Pretreatment Requirements:

Typically, no pretreatment is required, however, in some cases, a concentrator (e.g., carbon or zeolite adsorption) may be used to reduce the total gas volume to be treated by the more expensive incinerator.

Cost Information:

The following are cost ranges (expressed in 2002 dollars) for packaged thermal incinerators of conventional design under typical operating conditions, developed using EPA cost-estimating spreadsheets (EPA, 1996a) and referenced to the volumetric flow rate of the waste stream treated. The costs do not include costs for a post-oxidation acid gas treatment system. Costs can be substantially higher than in the ranges shown when used for low to moderate VOC concentration streams (less than around 1000 to 1500 ppmv). As a rule, smaller units controlling a low concentration waste stream will be much more expensive (per unit volumetric flow rate) than a large unit cleaning a high pollutant load flow. Operating and Maintenance (O & M) Costs, Annualized Cost, and Cost Effectiveness are dominated by the cost of supplemental fuel required.

a. **Capital Cost:** \$53,000 to \$190,000 per sm^3/sec (\$25 to \$90 per scfm)

b. **O & M Cost:** \$11,000 to \$160,000 per sm^3/sec (\$5 to \$75 per scfm), annually

c. **Annualized Cost:** \$17,000 to \$208,000 per sm^3/sec (\$8 to \$98 per scfm), annually

d. **Cost Effectiveness:** \$440 to \$3,600 per metric ton (\$400 to \$3,300 per short ton), annualized cost per ton per year of pollutant controlled

Theory of Operation:

Incineration, or thermal oxidation is the process of oxidizing combustible materials by raising the temperature of the material above its auto-ignition point in the presence of oxygen, and maintaining it at high temperature for sufficient time to complete combustion to carbon dioxide and water. Time, temperature, turbulence (for mixing), and the availability of oxygen all affect the rate and efficiency of the combustion process. These factors provide the basic design parameters for VOC oxidation systems (ICAC, 1999).

A straight thermal incinerator is comprised of a combustion chamber and does not include any heat recovery of exhaust air by a heat exchanger (this type of incinerator is referred to as a recuperative incinerator).

The heart of the thermal incinerator is a nozzle-stabilized flame maintained by a combination of auxiliary fuel, waste gas compounds, and supplemental air added when necessary. Upon passing through the flame, the waste gas is heated from its preheated inlet temperature to its ignition temperature. The ignition temperature varies for different compounds and is usually determined empirically. It is the temperature at which the combustion reaction rate exceeds the rate of heat losses, thereby raising the temperature of the gases to some higher value. Thus, any organic/air mixture will ignite if its temperature is raised to a sufficiently high level (EPA, 1996a).

The required level of VOC control of the waste gas that must be achieved within the time that it spends in the thermal combustion chamber dictates the reactor temperature. The shorter the residence time, the higher the reactor temperature must be. The nominal residence time of the reacting waste gas in the combustion chamber is defined as the combustion chamber volume divided by the volumetric flow rate of the gas. Most thermal units are designed to provide no more than 1 second of residence time to the waste gas with typical temperatures of 650 to 1100°C (1200 to 2000°F). Once the unit is designed and built, the residence time is not easily changed, so that the required reaction temperature becomes a function of the particular gaseous species and the desired level of control (EPA, 1996a).

Studies based on actual field test data, show that commercial incinerators should generally be run at 870°C (1600°F) with a nominal residence time of 0.75 seconds to ensure 98% destruction of non-halogenated organics (EPA, 1992).

Advantages:

Incinerators are one of the most positive and proven methods for destroying VOC, with efficiencies up to 99.9999% possible. Thermal incinerators are often the best choice when high efficiencies are needed and the waste gas is above 20% of the LEL.

Disadvantages:

Thermal incinerator operating costs are relatively high due to supplemental fuel costs.

Thermal incinerators are not well suited to streams with highly variable flow because of the reduced residence time and poor mixing during increased flow conditions which decreases the completeness of combustion. This causes the combustion chamber temperature to fall, thus decreasing the destruction efficiency (EPA, 1991).

Incinerators, in general, are not recommended for controlling gases containing halogen- or sulfur-containing compounds because of the formation of highly corrosive acid gases. It may be necessary to install a post-oxidation acid gas treatment system in such cases, depending on the outlet concentration (EPA, 1996a). Thermal incinerators are also not generally cost-effective for low-concentration, high-flow organic vapor streams (EPA, 1995).

Other Considerations:

Thermal incinerators are not usually as economical, on an annualized basis, as recuperative or regenerative incinerators because they do not recover waste heat energy from the exhaust gases. This heat can be used to preheat incoming air, thus reducing the amount of supplemental fuel required. If there is additional heat energy available, it can be used for other process heating needs.

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